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INDEX TO VOLUME VI.

AUTHORS.

ORIGINAL ARTICLES.

SELECTIONS FROM ENGLISH JOURNALS.

TRANSLATIONS.

CORRESPONDENCE.

OBITUARY.

EDITORIAL NOTICES.

SOCIETY PROCEEDINGS.

SUBJECTS OF THE ORIGINAL ARTICLES.

AUTHORS AND SUBJECTS OF THE TRANSLATED ARTICLES.

SUBJECTS OF THE SELECTED ARTICLES.

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SOME REMARKS ON TRANSPLANTATION OF THE CORNEA AND ALLIED SUBJECTS.

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Corneal opacity is the opprobrium of ophthalmic surgery. Almost every other diseased tissue has yielded at least partial success to the advance of modern eye surgery. Destroyed eyelids are restored by plastic operations, occluded pupils are re-opened, opaque lenses are removed, foreign bodies are discovered and often removed by the electro-magnet. Glaucoma is transferred from the list of incurable to curable diseases. Amaurosis has become almost an obsolete word in ophthalmological literature. But the irremediably blind from corneal opacity remain so still, and surgeons can offer these unfortunates no more hopeful prognosis than the poor one given by some such operation as Darwin suggested in 1801 who asks, "Could not a piece of the cornea be cut out by a kind of *trephine* about the size of a thick bristle, or a small crow quill, and would it not heal with a transparent scar ?" "An experiment," he adds, "I wish strongly to recommend to some ingenious surgeon or oculist."[1]

This experiment has been tried by many ingenious surgeons and oculists with such uniformly discouraging results that it seems like almost a useless waste of time to call attention to the subject again, and I should not do so if it were not, that the newspapers have given the subject so much notoriety, and have created

[1]Zoonoma, Ed. 1801, Vol III, p. 71.

the false hope in the minds of many incurably blind people that they may have useful vision again. Even a few medical journals have been beguiled into publishing glowing accounts of cases of successful transplantation of the cornea, so that it is not surprising that the general practitioner, who has given the history of the subject but little attention, may have been misled as to the results of the operation, and not infrequently sends patients to the specialist with a promise of relief which cannot be afforded, and as a result, the reputation of both the general practitioner and the oculist must suffer.

It was the classic Mead who, in his chapter on albugo, recommended the use of equal parts of powdered glass and sugar candy levigated to an impalpable powder. "A little put into the eye every day," he says, "gradually absterges and wears off the spot by its inciting quality."

This, I imagine, was somewhat more effectual than the modern molasses treatment recommended by a countryman. Another method very highly recommended by this author is to order a dexterous surgeon to pare it cautiously every day with a knife. He adds, with amusing *sang froid:* "The paring of the cornea has not succeeded above once or twice with me."[1]

Sclerectomy is the name applied to the attempt which has been made to form an artificial pupil by the removal of a small portion of the sclerotic and choroid in cases in which the whole cornea is opaque, in the hopes that the space might be filled up by a transparent membrane. This opening for a time does certainly permit of a shadowy outline of near objects, but the opening soon contracts and becomes closed with a dense cicatrix, so that practically it has proved of no benefit.[2]

Martin, in a recent number of the *London Medical Record,*

[1]Medical Works of Richard Mead, M. D., Edinburg, 1775. P. 410.

[2]Those interested in this subject can refer to the following works: Schmid, de Pupilla artificiali in Scleroctica aperienda; Tubingae, 1814. Ammon, in Zeitschrift für die Ophthalmologie, Vol. I., p. 109; Dresden, 1831. Wutzer, Ibid, P. 486. Villnan in Ibid, P. 123, Vol. II, Dresden, 1832. Nimmo in Glasgow Medical Journal for April, 1833. William Mackenzie, Disease of the Eye, Third Edition, London, 1840, P. 760. Antwerth Tübingen, Blätter für Naturwissenschaft, Vol. I, P. 88.

proposes division of one rectus and the advancement of the opposite so as to rotate the globe about 45°. A gold canula is then inserted into the sclerotic, and the conjunctiva united over it until inflammation has subsided, when the conjunctiva over the canula is destroyed by cauterization, and a glass stopper inserted to allow the entrance of light. Comment seems scarcely necessary, but the absurdity of the suggestion only forces the unwelcome truth the more upon us, viz., that all of these operations devised up to the present time have proved impracticable and unsatisfactory.

Akin to sclerectomy and the insertion of a gold canula is the proposition of Dr. Nussbaum, first made in 1853, to make an opening through the opaque cornea and to insert a small piece of glass shaped like a shirt-stud, with the hopes that it will be permanently worn there without inconvenience and will act as a substitute for the transparent cornea.[1]

Heusser records one case in which the glass button remained in the cornea and permitted useful vision for three months after its introduction.[2]

In this connection a report of the following case, from my own practice, which has not been hitherto published may be of interest.

Mr. Hull, a druggist of Cleveland, æt. 35, on July 4, 1885, was charging a soda fountain when it exploded, filling his eyes with acid which resulted in sloughing of the entire cornea and the lids of both eyes. A dense cicatrix with no lids nor any corneal tissue proper was formed, holding the eyeballs almost immovable. Notwithstanding this condition the tension remained about normal, the perception of light was good and so far as I could judge there was no intra-ocular inflammation or degeneration.

I decided to insert a glass button in one eye. This I did in July, 1886. When the bandages were removed, the button

[1]Zeitschrift für Wissenshaftliche Zoologie; Vol. V., P. 179, 1853.

[2]Aerztl. Intelligenzblatt, 1860, No. 24. Stellwag on the Eye; fourth revised edition, Wm. Wood & Co. 1873. P. 113.

was retained in situ very firmly. The perception of light was, however, almost abolished.

This, as the ophthalmoscopic examination revealed, was due to a large clot of blood, covering the back portion of the button. This clot gradually became absorbed, the perception of light slowly returned, and at the end of three months the patient could see the outline of large objects, count fingers, and distinguish colors. But in the course of a few months the eye began to grow soft, there was a slight oozing of a sticky substance around the button for a time, although it remained in the eye without causing any particular trouble for almost two years, and probably could have been retained longer, but the sight gradually became less, and at the end of a year and a half, he was practically blind.

At the present time, about two years and a half after the operation, the eyeball is soft and shrunken, and much smaller than the other, although the tension has become very much reduced and the perception of light has disappeared from the unoperated eye also.

The results of this operation led me to believe that: 1st. A glass button may be worn for an indefinite period. 2nd. That in order to make this possible, it may be well to limit the movements of the eye, by inducing an adhesion between the lids and eyeball. 3rd. That the improvement of vision will only be temporary as the constant irritation by the foreign body will sooner or later cause a disorganization of the eye. 4th. It will be necessary if the lense has not escaped from the eye to first remove it. 5th. It will also be as well to remove as much as possible of the iris, since its contact with the glass button would be undesirable. I offer these suggestions for what they are worth, and I would be pleased to hear from any one who has made experiments in this direction.

This brings us to the consideration of the subject proper, Corneal Transplantation.

Reisinger, of Augsburg, in 1818, first proposed this operation, and published results of experiments on animals in 1824, which were quite "promising." Dieffenbach in 1831 repeated

these experiments a number of times without success.

In 1839 the Medical Faculty of Munich offered a prize for the best work on the subject of Corneal Transplantation, but it led to no practical results.

Prof. Wutzer, of Bonn, in 1844, made use of the cornea of a live sheep, which he transplanted to that of a human cornea. Union took place but in a few weeks it became quite opaque. He repeated the experiments with no better results.[1]

About the same time Hurley and Thorne, of Bonn, made quite a number of satisfactory experiments in the same direction.

In the *Gazette des Hopitaux* for Aug., 1845, Dr. Plouviez states that during five or six years he had performed the operation a great many times. Yet, he had not been able to secure permanent transparency in a single instance.

Among the cases reported was that of a woman 23 years old who was blinded when three years old by small pox, in which, after separating the opaque cornea, he applied on the stump, and secured by four sutures, the cornea of a young dog that had just been killed.

The grafting succeeded perfectly, but the results were not satisfactory; the only benefit resulting from the operation was that the woman could distinguish day from night better than formerly.

M. Faldman[2] reported the results of twenty experiments made at the suggestion of Walther, of Munich, and comes to the conclusion, that the transparency of the cornea which subsists for a few days after the operation, disappears afterwards.

Dr. Kissman reports a case in which the cornea of a pig was transplanted to that of an Irishman. The cornea continued transparent for a fortnight, when it became opaque, and in the course of a month it was absorbed.

We might cite numerous other cases from the literature of ophthalmology of forty or fifty years ago, in which the results

[1]New York Medical Journal for March, 1844.

[2]In Vol. 42 of the Edinburgh Medical Journal, page 256.

of transplantations are detailed, showing that surgeons then met with the same flattering results for the first few days or weeks, only to find the cornea become opaque, and the patient no better after, possibly no worse, than before the operation.

Among the more recent contributions to this subject is that of Mr. Henry Powers,[1] of London. His operation consists in removing a portion of the opaque cornea of the patient with a sharp punch, specially devised for the purpose, and obtaining by the same measure an exactly corresponding portion of a healthy rabbit's cornea, and transferring it to the space in the human eye.

In one case he reports he found the union complete, and the results "promising."

Dürr[2] made a number of experiments in transplanting pieces of the cornea from 5 to 8 mm. long, by 5 to 6 mm. broad, and 1 m. in thickness, covered with epithelium. The freshened surface was somewhat smaller, a narrow slip of sclerotic tissue was removed, with the cornea, together with a portion of the conjunctiva which served as a flap to be secured by sutures.

Among others he reports the case of a boy in a blind-asylum, whose one eye was shrunken while there was dense leucoma of the cornea of the other. The transplanted cornea adhered in two days. During the first few days it was cloudy, but gradually it became clear, so that at the end of two months the transplanted piece resembled an island of clear cornea, and the boy was enabled to see large objects, and find his way about. This operation like the more recent one of Von Hippel presupposes that Descemet's membrane is transparent, which is not the case of the vast majority of cases, and necessarily makes the field of this operation a limited one. Mr. Wolfe,[3] of Glasgow, Scotland, has, however, perfected the operation of transplanting the entire thickness of the human cornea from

[1]Medical Times and Gazette, Aug. 10, 1872.

[2]Klinische Monatsbl. f. Augenheilkunde, Sept., 1877.

[3]Wolfe on Disease of the Eye.

one eye to another, and has reported some excellent results. In one of his cases good union took place, and on the fourteenth day after the operation the patient could see sufficiently to point out a ring on the finger. Before dismissal from the hospital he could distinguish between a half sovereign and a shilling. After dismissal he was exposed to severe cold and privation, and the new cornea became opaque. His operation consists in transplanting a long narrow piece from the entire breadth of the cornea which is connected with a conjunctiva flap at either end. The clear cornea is retained in its new position by means of sutures through the conjunctival flaps.

Sellerboeck[1] has operated upon a number of cases in a similar manner, with temporary improvement of vision and promising results.

One disadvantage of this operation is that it requires a human cornea which is often difficult to obtain ; or at least the cornea of some animal whose cornea is of the same size, similar thickness and curvature.

De Wecker[2] uses a small trephine with which he removes a small circular piece of cicatricial cornea to be replaced by a similar piece of clear cornea from another eye which has been recently enucleated. He says, "We have no right in these cases to refuse the slightest aid to sufferers who have but this one remaining chance to recover a little sight ; neither should we be deterred by the reproach of eccentricity which will certainly be leveled at any one who shall attempt to graft a cornea."

Von Hippel, in 1885, succeeded in giving a patient (who could see only to count fingers at a distance of six feet before the operation) vision of $^{20}/_{cc}$, and since then he has reported another case in which there has been considerable increase of vision.

Leber demonstrated that any breach of continuity of Des-

[1]Archiv f. Ophthalmologie, xxx.

[2]Ocular Therapeutics 1879. Page 145.

cemet's membrane is followed by discouraging action of the aqueous upon the overlying parenchyma of the cornea. Von Hippel acting upon this suggestion removed a button of the opaque cornea leaving Descemet's membrane intact, and with the same trephine a button from the whole thickness of a rabbit's cornea is excised, and laid in the wound. In his operation he uses a trephine very similar to a Hœurteloup's leech, and the piece is taken from the centre of the leucomatous cornea and so as not to include the entire thickness of the cornea.

It will be seen that the field, for this operation must be a very limited one, as it presupposes that Descemet's membrane is transparent.

In such a case it may be a question whether the same results might not have been gained by irritants, or by simple incisions and friction, or, possibly, by the heroic use of jequirity. May not the improvement of visual acuity have been due to the inflammation induced by the presence of a foreign body rather than to the clearness of the transplanted cornea?

Adamük[1] has also made some interesting observations in this direction. He considers the preservation of Descemet's membrane of much less importance than the preservation of some portion of the neighboring sclerotic, whence the cornea draws its nourishment. Of five cases in which the trial was made on fowls' eyes, suppuration took place in two, the transparency of the cornea was preserved in three cases, but we are not told with what visual results.

Adamük's operation is similar to Dürr's, excepting that he transplants the entire thickness of the cornea.

Fox[2] has reported glowing accounts of brilliant results secured in two cases operated upon by the Von Hippel method. The results as reported later by the newspapers have evidently not been so favorable. In one case we are told the cornea

[1]Klinische Monatsblätter, 1887,

[2]Philadelphia Press, Cincinnati Enquirer and other daily papers.

sloughed, and in the other a suit has been commenced for damages.

Chisolm[1] has reported a case in which he secured union of the transplanted cornea by the Von Hippel method, but the cornea remained opaque.

My personal experience in this operation has been confined to a few operations of transplanting, by Wolfe's method, the cornea of one rabbit to that of another.

When the operation was done carefully, in about one-half the cases the cornea would unite and remain clear from one to two weeks, after which it would gradually become opaque; the eye usually became soft, and *phthisis bulbi* was the result. These experiments were, however, performed under such circumstances as to have but little scientific value. Yet the results were so discouraging as to deter me from attempting the operation on the human eye until some more promising results will have been attained by those who are in a position to make the experiment under more favorable surroundings.

It may be assumed from our present experience with this operation that:

1. The cornea when transplanted, either by the methods of Dürr, Wolfe or Von Hippel, will become adherent.

2. That by any of these methods the graft will remain clear for a short time, but eventually become opaqe in the vast majority of cases. Frequently the eye becomes soft and *phthisis bulbi* will result.

3. There is some common cause for failure either inherent in the eye operated upon, the grafts themselves, or the method of operation. This is a matter that will demand the attention of all in future experiments and operations made in this direction.[2]

4. Glowing newspaper reports of successful corneal transplantation should be taken *cum grano salis.*

5. Other methods of treating corneal opacities should be

[1]Maryland Med. Journal, June 30, 1888.

[2]Johnson, British Medical Journal, Dec. 16, 1886. P. 1209.

re-investigated, especially the scraping of opacities and daily friction as recommended by Dr. Danziger, and the central cauterization of the cornea by the galvano-cautery loop, as recommended by M. Louis Vacher, also the pricking of the cornea, galvanism, subconjunctival injections, all of which have proved beneficial in the hands of many operators. This may even prove a more fruitful field for investigation and experiment than corneal transplantation.

THE VALUE OF CREOLIN IN OPHTHALMIC PRACTICE.

BY ADOLF ALT, M. D.

Ever, since the enthusiastic article by Purtscher in *Hirschberg's Centralblatt* drew my attention to the new disinfectant, creolin, I have used it almost daily. My experience with this remedy is such that I do not hesitate to draw the attention of my *confrères* to it.

Originally creolin was manufactured by the firm of W. Pearson & Co. in Hamburg, Germany, and they described it as being a dry destillate from English coal. The controversy as to its real nature, which has gone through the journals, does not concern us here. The trustworthy firm of Merck, of Darmstadt, now manufactures it also. It is a thick, oily, dark brown fluid with a peculiar smell, reminding one of tar, carbolic acid and the smell around gas-factories. When mixed with water it makes a milky solution (probably emulsion). After such a solution has stood for several days, it changes its milk-color and assumes a brownish tint ; at the same time small brown globules become separated from the rest of the solution and sink to the bottom of the bottle. It is, therefore, probably best to make only a small quantity of such a solution and to renew it every two or three days. I have used it in a 1% and 2% solution. In this strength, instilled into the conjunctival sac, it causes a very severe pain followed by profuse lachrymation. This pain lasts about a minute and then disappears. The previous instillation of a cocaine solution does not seem to have any effect on this pain.

I have tried its application by instillation in all forms of external eye-affections, in order to see whether it would really prove superior to other known remedies, especially the bichloride of mercury. Its action surely equals that of bi-chlo-

ride of mercury in catarrhal conjunctivitis, blepharitis ciliaris, in corneal ulcers, and in lachrymal troubles. In phlyctænular keratitis it acts more beneficially than sublimate. Its most beneficial action, however, creolin exerts on parenchymatous keratitis, whether syphilitic or scrofulous. I have seen corneæ clear up in an astonishingly short time under its application, which appeared to have remained unchanged and uninfluenced by any other of the usual methods of treatment. In trachoma, for which it has been highly praised by some authors, I have not been able to see any benefit from its use. In fact, in the few cases I tried it, it seemed to aggravate the process in such a manner as to make me afraid to use it again.

Creolin is also very useful as a hæmostatic. After lid-operations and enucleations I have repeatedly, in a very short time, staunched what was an excessive hæmorrhage, by the use of creolin.

Since first experimenting with creolin I have discarded all other methods for disinfecting the instruments used in an operation. They are always put into a 2% solution of creolin, and from it I take them during the progress of the operation as I need them. Aside from its perfectly satisfactory action in rendering the instruments aseptic, it is superior to sublimate, boracic acid, etc., by in no way influencing the sharpness of the instruments. I also wash my hands in it before every operation, and wash the conjunctival sac with it. I further prefer it when bandaging eyes operated upon to sublimate for moistening the cotton.

Aside from the pain which it causes when instilled into the conjunctival sac, I have found nothing disagreeable in its use.

Several times after prolonged contact with it in operations lasting from half an hour to an hour, I tasted it for hours. Unpleasant as it was, this absorption of creolin had no other, especially no poisonous, effect upon me, as far as I know.

From the foregoing experiences I can very well add my testimony to that of Purtscher, and recommend the application of creolin especially in *parenchymatous keratitis*. I, furth-

ermore, can recommond it strongly as a disinfectant for surgical instruments and as a hæmostatic.

Incidentally, I may mention here that it has also under my observation acted very well in old cases of purulent otitis media.

PARTS OF THE INTRODUCTION TO A DISCUSSION ON THE TREATMENT OF SENILE CATARACT.

BY R. BRUDENELL CARTER, F.R.C.S.,

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In the Section of Ophthalmology at the Annual Meeting of the British Medical Association, held in Glasgow.

* * * With these preliminary observations, I pass on to the main subject which we have in hand; and I fear it must be conceded that the "treatment" of senile cataract must be limited to the methods by which it can be removed from the eye. The various plans which have from time to time been advocated as likely to bring about a restoration of the transparency of the lens, have all, as far as I have been made acquainted with them, led to the disappointment which a moderate acquaintance with anatomy and physiology would probably induce us to anticipate. The instances of spontaneous cure by absorption or dislocation have been too few in number and too slow in accomplishment to have any bearing upon the demands of ordinary practice. What we have to consider is the removal of the cataract, and the removal only.

Admitting this to be so, the first question which we must take into account is the period of development of cataract at which its removal may be safely undertaken; and here we are met by the difficulty of so employing words as to present a

precise picture of the different physical conditions with which we may have to deal. I can remember the time when it was thought inexpedient to extract an opaque lens so long as any layer of transparent tissue intervened between the opacity and the anterior capsule, so long, that is, as the iris, in oblique illumination, would cast a crescentic shadow, no matter how narrow, upon the opacity. The observance of this rule led, indeed, to brilliantly successful results, but it also condemned patients to long periods of waiting which were exceedingly depressing, which meant to the poor the loss of comforts, and, sometimes even to those who were not poor, serious impairment of the general health; and the tendency of my own work, as well as of that of others during the last few years, has been greatly towards operating at a somewhat earlier date. The first step in this direction was probably taken by von Graefe, when he advised that, in cases where one lens was more advanced than the other, and when the first had been successfully extracted as soon as it was mature, the surgeon should "proceed boldly" with the second. Since then, however, great progress has been made. I tried, several years ago, the method of hastening maturation by a needle puncture of the anterior capsule, performed about six weeks after a preliminary iridectomy; but the results of this course were not sufficiently encouraging to induce me to continue it; and I have no experience of the effect of the more recent practice of hastening maturation by something which may be called massage. I find that, after a preliminary iridectomy, made sufficiently long before the final operation to allow the cut edges of the iris to be completely healed, it is possible to extract with safety almost any lens which is sufficiently opaque to involve practical loss of vision; and that, while it is not always possible completely to clear away the cortex in such cases, yet that the resulting iritis, if any should occur, is usually quite controllable, so that perfectly good ultimate results may in this way be attained. I am disposed to think that the disastrous effects of the iritis which so often follow the extraction of an immature lens were mainly due to the fact that, until quite recently, no sufficient

care was taken to exclude septic influence; and that it was the character, rather than the fact, of the inflammation to which it was indebted for its too common consequence. To this part of the question it will be necessary for me to return.

I was for many years accustomed to perform the extraction of cataract under profound anæsthesia from chloroform or ether, and during this time I had no sympathy with those who advocated the abandonment of these agents. No doubt their use was sometimes attended by hurtful consequences, as when the return of consciousness was followed by severe vomiting, or when, in the course of recovery, reflex spasm of the external muscles was produced prior to the completion of the dressing. Notwithstanding this, I am convinced that the balance of advantage was definitely in their favor, and that the accidents which occurred under their employment were largely due to imperfect administration. All this, however, since the introduction of cocaine, has been relegated to the domain of ancient history; for I presume that cocaine is now used by every operator, and that the only question to be discussed with regard to it has reference to the best method of application. I have used solutions of various strengths, and wafers, and have finally settled down upon the latter. The wafers which I find best are those prepared by Messrs. Savory and Moore, which contain a fiftieth of a grain of the alkaloid in each, and which are made with gelatine and glycerine, combined in such just proportions as neither to be sticky in damp weather nor brittle in hot weather. Cocaine has the single disadvantage of causing dilatation of the pupil, by which the iris may be brought somewhat into the way of the knife; and I barely counteract this influence by the use of a single wafer of eserine. The nurse is directed to apply the eserine wafer, in the lower conjunctival sac, an hour before the time of operation. Half an hour later, she applies a cocaine wafer in the same position, and then, after the lapse of ten minutes, by which time general superficial anæsthesia is obtained, she applies a cocaine wafer every five minutes, lifting the upper lid while the patient looks down, and placing each successive wafer upon the region of

the incision, just above the margin of the cornea. By the time that five wafers have been thus applied, and by the time that the instruments have been placed in readiness, the operation will always be comparatively painless, and often absolutely so. It is generally prudent to tell the patient of the moment of puncture, and also of the moment when the iris is to be cut, because, if not warned, and if he felt anything, he might suddenly start, or make some other embarrassing movement.

We arrive now at the consideration of antiseptics, the employment of which is calculated, I feel sure, to remove from the operation many conditions which were frequent sources of failure in former times. My experience leads me to the conviction that the asepticism which is useful and necessary in eye operations may be adequately expressed by the one word cleanliness, and that the septic inflammations of an earlier period were mainly due to the introduction into the anterior chamber of albuminous matter in a state of change, often, no doubt, by means of dirty instruments. Of atmospheric air and its contained microbes, even of the air of the operating theatre of a hospital, I have absolutely no fear; for I have seen, not once or twice, but times without number under general anæsthetics, and with greater proportionate frequency under the complete abolition of reflex muscular action which we obtain from cocaine, the entrance of a large or small bubble of air into the anterior chamber. Sometimes the bubble can be quickly coaxed out again, sometimes it is obstinately adherent to its new quarters, but I have never seen any harm follow from its entrance, whether it was removed or left behind; and now, if it does not escape quite easily, I take no heed of it. The sources of septic inoculation which I chiefly fear are the notch between the teeth of the iris forceps, and the shoulder of the cystotome, both of them places in which the material remnants of former operations are likely to remain. When this idea first occurred to me, I made it a practice to examine these portions of the instruments in question, when they were supposed to be clean, with a sufficiently powerful lens, and I have in this way seen enough dried blood, or

dried lens cortex, adhering to them to explain the prompt destruction of any eye into which they were introduced. My present practice, after returning from an operation, is to wash these instruments with hot soap and water and a soft badger's hair tooth brush, and to examine them with a magnifier before they are put away. Then, immediately prior to an operation they are dipped into absolute alcohol, and dried upon a piece of suitable soft tissue. The knives, scissors, and other instruments which offer no similar coigns of vantage for the lodgment of dirt, after a preliminary cleansing in the ordinary way, are also dipped into absolute alcohol before being used.

Not less important than the instruments are the sponges. No other absorbent material will adequately replace a small piece of soft sponge as a means of quickly removing blood or fluid or soft cortex from the conjunctival surface or from the vicinity of the wound; but the absolute cleanliness of what is thus employed is a matter of the first necessity. After a thorough preliminary washing in cold or lukewarm water, in order to remove all traces of blood without coagulating its albumen, my sponges are prepared by soaking them for a few minutes in a mixture of Condy's fluid and water, which must not be too strong, as the permanganate rots the sponge tissue, and this effect, which is valuable as a source of softness if not carried too far, might easily proceed to complete disintegration. After being rinsed in clean water to free them from the Condy, they are next thrown into a mixture of equal parts of the sulphurous acid of the *Pharmacopœia* and water, and they remain in this for a few minutes until they are completely bleached. They then receive a final rinse in water, and are ready for use. They must, of course, be moist at the time of operation, and they may be moistened either with water or with the antiseptic solution of which I have next to speak.

During the last year or two, especially in Paris, much use has been made of real or supposed mercurial antiseptics in the extraction of cataract. I say real or supposed, because one of these preparations—the formula for which was published in a medical journal—was said to be an aqueous solution of binio-

dide of mercury. As biniodide of mercury, in my younger days, was insoluble in water, I had the curiosity to have the liquid made according to the directions given, and then tested for mercury, of which it was found to contain none. This was probably an advantage, because mercurial solutions, unless so weak as to have no promise of any kind of potency, are active irritants; and I have quite convinced myself that the amount of swelling which sometimes follows Dr. Mules's operation for the insertion of an artificial vitreous is largely attributable to the use of mercuric perchloride as an antiseptic. Carbolic acid will often greatly disturb and irritate the corneal epithelium; and, after many trials of various preparations, I have come to the conclusion that the boroglyceride, first suggested by Professor Barff, is at once the least irritating and the most efficacious. I use it in a solution of 15 per cent. in distilled water.

As the eye, in cataract extraction, is scarcely at all touched by the fingers of the surgeon, and as I have already stated that I have no fear of the entrance of air, it follows that the only septic influence to be removed must be sought in the secretions of the conjunctiva and lachrymal passages, and, above all, in the gelatine of the dissolved cocaine wafers. Especially on account of the latter I should fear to introduce into the anterior chamber even a knife which had come into contact with the uncleansed surface of the eyeball. My first step is to wash the whole of the conjunctiva carefully with the solution of boroglyceride, which is suffered to fall upon the eye from a pipette, and is distributed over the surface by closure and gentle friction of the lids. This washing is twice or thrice repeated, until I am sure that all gelatine is cleared away or disinfected; and then the margins and surfaces of the lids are themselves washed with the same solution applied by a morsel of sponge. If a cocaine solution has been employed, and if this is saturated, as it should be, with salicylic acid, the washing of the conjunctival sac is unnecessary; but the action of the wafers is, I think, more trustworthy, and the complete removal of their gelatine should never be omitted.

The surface of the conjunctiva having been thus prepared, the next step is the elevation of the lid. For this purpose I have abandoned the use of the spring speculum from the time of the introduction of cocaine, and use a slight modification of Dr. Noyes's well known retractor. In the original instrument the groove is straight, and, as the eyelid is curved and somewhat stiff, it is uncomfortable within the groove, and is sometimes released by involuntary muscular effort. I have had the groove curved, and with this alteration the lid lies in it without movement. I commit the handle of the retractor to a nurse or assistant, who stands on my right, using the left hand for the right eye. The hand holding the retractor passes between mine, and does not in the least interfere with their freedom of movement. My instruction to the assistant thus employed is simply to lock up the eyelid under the brow without exerting any pressure upon, or even without permitting any contact with, the eyeball, and the lid can be released in a moment whenever occasion to do so may arise. I then draw down the lower lid with one finger, and fix the eye by pinching up a vertical fold of conjunctiva and subconjunctival tissue, exactly on the vertical meridian, and as near to the lower margin of the cornea as will afford sufficient subconjunctival tissue to the grasp of the forceps. My fixation forceps have interlocking teeth, three on one blade and four on the other, and they present on the eyeball, when these teeth are closed, a smooth round, flat surface, at least two millimètres in diameter.

Mr. Critchett has lately recommenced a method of elevating the upper lid by the ring finger of the operator, while the fixation is accomplished by forceps held between the thumb and index finger of the same hand. With great respect for him, and with due regard to what I have already said about the personal element in all such questions, I think his method is mechanically inferior to that which I have described, and that is is, therefore, of less general applicability. By it the freedom of movement of the fixing hand, and the freedom of choice of the point of fixation, are both, to some extent, di-

minished. The operator who thus elevates the lid would find it impossible, I conjecture, to fix below the cornea exactly in the vertical meridian, and to this I attach importance, because it is only in this way that the line of section can be made to lie precisely parallel to the horizontal meridian. Unless this object is secured any astigmatism which may follow the operation is almost certain to have oblique chief meridians, by which the difficulty of obtaining perfect correction by lenses is increased, while in the few cases in which, if an adequate amount of subconjunctival tissue is picked up, the conjunctiva nevertheless tears, and a fresh and different hold has to be taken, the operator whose hand was also employed in elevating the lid would, I imagine, find himself placed at a decided disadvantage.

In the method of fixation which I have described, the margin of the lower lids is held down, and kept out of the way by the forceps themselves.

It has been said that any text in the Bible will serve the turn of a preacher who has something to preach about; and, in the same way, almost any cutting implement would allow a skilful surgeon to divide the tunics of the eye in such a manner as to give exit to the lens. Nevertheless, the form of the knife deserves consideration, and my own requirements are best fulfilled when it is as small as it can be made. My friend Dr. Randall, of Philadelphia, has lately written in such eulogistic terms of the concave knife which was contrived by Jaeger some years ago, that I have been induced to try it, with the result that I have gone into the very opposite extreme; and, instead of merely feeling a fondness for old knives of Lienhardt's pattern which have been reduced in size by grinding, I have requested Messrs. Weiss to make the smallest blades possible. The object of Jaeger's knife is that it should make a certain definite incision, by virtue of its own peculiarities, when it is pushed straight on in a mechanical way by the operator; and the object of mine is that it should require the volitional direction of the operation from the beginning to the end of its course, and its small bulk should allow its edges to

be turned forward as much as may be required, without any pressure being exerted upon the iris, or through the iris upon the periphery of the lens, by its back.

The fault of these very small blades is that they are prone to permit escape of the aqueous humor, especially in the hands of an operator who is very deliberate in introducing them, and that in this way the iris may fall over the edge. It is necessary, as soon as the point appears within the anterior chamber, to carry it across and to accomplish the counter-puncture quickly; at the same time pressing the back of the blade against the corneal tissue, so that the opening may not be enlarged by the cutting edge. A further security may be obtained by oiling the blade, a plan which I now adopt with every form of knife which I introduce into the eye, and by which not only is resistance much diminished, but the course of the blade, in cutler's phraseology, is materially "sweetened." I use a mixture of equal parts of castor and olive oil, to which five per cent. of eucalyptus oil is added, a mixture much in favor at St. George's Hospital as a general surgical lubricant. A drop of this oil may be placed on the tip of a finger, and the knife drawn through it immediately prior to the introduction. When once the counter-puncture is made, and the iris is sufficiently held back by the knife to be in no danger of falling forward or of being injured, the edge of the knife may be turned forward to any required extent in the wound, so that its direction between the punctures is absolutely at the command of the operator, and the section may be placed exactly as he may desire. The best position for it, I think, speaking generally—the position which affords the easiest exit to the lens—is that in which the puncture and counter-puncture are barely in front of the iris, and in which the centre of the incision is just behind the junction between the visible cornea and the conjunctiva, the knife carried a little backwards, after the more resisting structures are divided, so as to form a conjunctival flap. The profile of such a section bends forward in a slight curve; and, with the narrow knife of which I have spoken, the character and amount of the

curve may be determined as the operator may desire. With regard to the length of the incision, I fear I am unable to speak in millimètres, and must confess that I follow a sort of rule of thumb. I make my incision longer or shorter, according to my estimate of the bulk of the nucleus of the lens. I strive always to keep its base line parallel to a tangent with the upper corneal margin, but place this base line a little higher or lower as I wish the total length to be more or less.

I much regret that I have had no opportunity of witnessing what I hope we shall hear fully described in the course of the coming discussion, namely, the section made by Mr. Teale, and which, as I understand the description of it, is brought almost directly forward through the upper part of the cornea, and provides, by its shape and direction, for the perfect apposition of the cut surfaces. I am not in a position to speak of its merits; but I am bound to say that I have regarded all previous forms of section through the true cornea with great disfavor. I think they are all of them apt to produce, in the contraction incidental to healing, some distortion of the corneal surface which renders it no longer a surface of revolution, and which is therefore liable to entail a defect of vision which lenses are unable to correct. This applies very strongly, as I have often witnessed, not only to the proposal of Dr. Küchler to divide the cornea on its horizontal meridian, but also to the sections above or below the horizontal meridian, which were at one time advocated by Dr. Liebreich and by Mr. Bader.

We now approach the question which, more than any other, has been discussed of late years—the question of iridectomy as part of the operation of extraction; and, at the outset, I must express myself as being decidedly in favor of it. In order to state reasons, it is expedient to go back and to glance at the history of the matter. Iridectomy was first practiced by Mooren, as a preliminary measure to flap extraction, and it at once enormously reduced the percentage of his losses. Its beneficial operation was explained by him and by von Graefe, on the twofold ground that, by removal of the portion of iris which was otherwise most liable to be compressed and bruised

in the exit of the lens, it took away one active cause of subsequent iritis, and that, by facilitating the exit of the lens, and thus permitting the length of the corneal wound to be diminished, it diminished in a corresponding degree the risks of necrosis of the cornea. Operators whose experience goes back for only fifteen or twenty years can hardly realize that, thirty to thirty-five years ago, 15 per cent. of all the eyes operated upon were totally lost by general suppuration, which usually commenced on the second day as iritis, or by sloughing of the cornea. No doubt the iritis, although then commonly attributed to bruising, was frequently septic, and would not nowadays be permitted to occur; but we do see iritis in spite of all precautions, and I feel sure that iritis occurring after extraction in an eye which has been iridectomized may generally be regarded as a comparatively harmless complication, while iritis occurring in the same conditions in an eye which has not been iridectomized is a very threatening one. No one who has had experience of both methods can doubt that the iridectomy removes what must otherwise be an impediment, in a greater or less degree, to the exit of the lens, or that it fulfils the condition to which von Graefe attached so much importance, that of preventing the iris tissue from being bruised, or its circular fibres from being injured by rapid and forcible dilatation. Nor can there be any doubt that it greatly facilitates the complete removal of cortex, not only by direct pressure, but also by the introduction of a curette, which could not, of course, be carried into the space lying behind the uncut iris in the proximity of the wound. Another point which I would urge in favor of iridectomy is that it minimizes the ill-consequences of loss of vitreous. When vitreous escapes from an iridectomized eye, any further small amount which may be lost after the application of the dressings does not add in an appreciable degree to the attendant risks; but if the iris be entire, the immediate effect of the loss is to lift the iris into the section, and thus to produce, even in favorable cases, entanglement, delayed healing, and distortion of the corneal curvature. Against these advantages, what is there to be said on the other side? I am,

perhaps, hardly a competent judge, for I was, I believe, the first surgeon in England to perform iridectomy as preliminary to extraction. This was in 1862, soon after Mooren sent me his pamphlet on the subject. I have never since performed extraction without iridectomy, either as a preliminary measure or as part of the operation, and I have never seen a single case in which I could say, if this eye had not been iridectomized, the result would have been better than it is. In my first cases, twenty-five years ago, I selected patients upon whom I had previously performed flap-extraction on the other eye with good results, and I satisfied myself that, in these persons, the vision of the second eye, which was iridectomized, was as good as that of the first, which was not. In eyes which, apart from cataract, are healthy, I very often obtain normal vision, and I therefore fail to see why the iridectomy should not be performed in every instance. In fact, I think that those who object to iridectomy surrender their whole case when they say, as they generally do, that they would reserve the procedure for cases in which there was some unusual risk. They confess by this that iridectomy increases safety, or, as I should prefer to put it, that it increases the percentage of success; and, if so, why should any patient be deprived of this advantage? I am quite certain that I have seen iridectomized eyes recover from accidents and complications which, but for the iridectomy, would, I believe, have been fatal to them; and such accidents or complications cannot always be foreseen. I would cite as an example an accidental blow, three or four days after the operation, which produced considerable intraocular hæmorrhage. That was five years ago, and the recovery was protracted, but the patient has now normal vision. I fully admit that admirable results may be obtained without iridectomy; but I take my stand upon the position that the surgeon might frequently have occasion to regret having omitted iridectomy, while I believe that he will never have occasion to regret having performed it. In the cases of a special kind, in which it is generally advocated even by those surgeons who have abandoned it in normal conditions, in cases of diabetic cataract, in

very marasmic subjects, and the like, my own practice is still to make a rather large iridectomy as a preliminary measure, so as to obtain firm healing of the cut edges of the iris before they are exposed to the possibilities of irritation from residual cortex, whereas, in otherwise healthy eyes, I make my iridectomy smaller, and make it as a part of the general operation.

The iridectomy having been accomplished in the ordinary way, the next steps have reference to the capsule. In a very aged patient I always make a large iridectomy, followed by a gentle endeavor to coax out the lens in its unbroken capsule, and when this succeeds the result is usually extremely satisfactory. Except in the very aged, such an endeavor would be attended by risk of rupturing the hyaloid, and whenever the attempt is either not made or is abandoned, I divide the capsule as freely as possible, first vertically, beginning at a point well below the lower margin of the pupil, and then peripherally. In pressing out the lens I aim at the definite object of causing it to turn upon its horizontal axis, so as to present its upper edge to the section, and for this purpose make my pressure, in the first instance, directly backward over the lower portion of the cornea, using sometimes the back of the silver curette, sometimes that of the shell spoon, and following the lens up the cornea as it advances, until its diameter is fairly outside the edges of the wound, when the pressure may be relaxed, and the exit left to be completed by the resiliency of the tissues.

Mr. Tweedy has lately advocated a simple peripheral division of the capsule in cases of immature cataract, with the idea that the lower part of the capsule is thus left as a sort of pocket, which retains residual cortex until it is dissolved, without permitting it to be at large in the anterior chamber, and a source of general irritation to the eye. I am afraid that this pocket will be found difficult to empty, that it will sometimes retain a good deal more than is desirable, and that its contents may often become sources of prolonged trouble. Even in immature cataracts I much prefer a thorough division of the cap-

sule, and a sedulous endeavor to coax out as much as possible from the eye. Under cocaine this may be done without risk of exciting reflex spasm of the recti, and consequent loss of vitreous; and by the devotion of sufficient time may always, I think, be so effectually accomplished that any small portion which is necessarily left behind is not likely to occasion more than temporary difficulty. In immature cataracts, however, it must be remembered that the vision test cannot be relied upon as a proof of the complete removal of cortex. When this is still transparent it may, even when present in considerable quantity, permit the patient to recognize the different fingers of the surgeon, and the appearance of the pupil under focal illumination furnishes indications which are much more trustworthy. After the fingers can be recognized, continued careful and dexterous manipulation will often expel quite a considerable quantity of viscous cortex. The manipulation required is not only very difficult to describe, but is too familiar to such an audience as this to require description. It consists of gentle upward stroking of the corneal surface with the back of the customary shell spoon, alternating with careful rotatory friction through the closed lids, and the cortex may often be assisted to escape by separating the edges of the wound with a curette, or by pressing back the posterior edge with Pagenstecher's spoon. I may, perhaps, be permitted to say that the perfect manipulation of the eye for the expulsion of the bulk of the lens, and afterward for the expulsion of residual cortex, appears to me to be quite the last attainment of the finished operator, and to be of infinitely greater difficulty and importance than any of the steps previously described, and by which it must of necessity be preceded.

With reference to clearing the capsule, we have to consider the question of "washing out," whether this be done, as by Dr. McKeown, for the purpose of completely removing the cortex, or, as more recently by other operators, for the purpose of introducing an antiseptic. The idea of washing out must, I think, have occurred to many people. I practiced it myself on one occasion, before the appearance of Dr. Mc-

Keown's paper. I was removing by suction, from the eye of a young lady, a lens which had been rendered opaque by an accidental blow, without any wound of the external tunics of the eye, and was removing it merely to restore the blackness of the pupil. Certain fragments did not fall readily into the suction tube, and I gently injected the lenticular space with water, using for the purpose an ordinary hypodermic syringe fitted with a blunt nozzle instead of a needle. The proceeding was effectual ; but, whether in consequence of it I cannot say, the eye passed into a state of chronic inflammation and ultimate wasting. After the appearance of Dr. McKeown's paper I obtained his syringe and used it in one or two cases, but I did not obtain from the practice any advantage which encouraged me to persevere. I have not used it for a considerable time, and, as far as I can foresee, am not likely to use it again.

Of the method employed by some operators, of washing out the capsule and the aqueous chamber with an antiseptic solution, I have at present no experience, and do not think it likely that I shall acquire any. I do not see that such a proceeding is likely to be attended with any good results which may not equally well be obtained without it; and it is certainly a complication which must entail additional risks in some directions, as, for example, of loss of vitreous. From descriptions which I have read, the injection of an antiseptic appears frequently to be followed by severe and long continued pain ; and I should regard this fact alone as sufficient to condemn it. Pain should, I think, as far as possible, be banished from surgery ; and it is certainly, more especially in old and feeble people, like the majority of cataract patients, highly detrimental to repair. I have also read of the use of a squirt for the purpose of displacing iris from the angles of the wound; but such displacement, when it is called for, seems to me to require only the careful manipulation of a whalebone spatula.

We come now to the question of dressing, on which we have lately been invited to return, as to a novelty, to the method which was universal thirty years ago, or, indeed, until von

Graefe introduced his pressure bandage, and which had then held uninterrupted possession of the field for a century. We are invited to fasten the lids together with bits of sticking plaster, and to abstain from the use of a compress. I find it difficult to criticise the proposal in any words more fitting than those which were applied, to a very different subject, by Lord Macaulay: "We are sick, it seems, like the children of Israel, of the objects of our old and legitimate worship. We pine for a new idolatry. All that is costly and all that is ornamental in our intellectual treasures must be delivered up and cast into the furnace—and there comes out this Calf!" If there be any established fact in surgery, I think it is that gentle uniform support promotes the healing of a wound; and I had too much experience of plaster, thirty years ago, to have any inclination to return to so primitive a material. After carefully removing all shreds of coagula from the conjunctival sac, after liberating the iris, if entangled, from the extremities of the wound, and after obtaining the best possible apposition of the wound edges by means of a spatula, I permit a few final drops of the boroglyceride solution to fall upon the eyes from a pipette, and then place over the closed lids of both eyes, whether or not only one has been operated upon, a piece of old pockethandkerchief, about an inch and a half square, smeared with Sanitas vaseline. I then take a portion of common non-absorbent cotton-wool, soak it in water, mould it into a shape like that of a meniscus lens, press out superfluous moisture, and place it in such a way that its concavity receives the projection of the eyeball. Both eyes being thus covered, I place horizontally over the wool pads the bandage which was, I believe, introduced by Dr. Liebreich, and which consists of a strip of knitted cotton; but I have three pairs of tape strings attached to it, one pair in continuation of its length, the other two pairs at right angles to the former. The horizontal pair being first tied with a proper degree of tightness, one of the other pairs is tied over the top of the head, the other under the chin. This bandage never slips nor becomes displaced, and the degree of pressure which it exerts may be

exactly regulated in accordance with the comfort of the patient. I usually renew the dressing twice a day, but without opening either eye, until forty-eight hours have elapsed; and the effect of the Sanitas vaseline is that the pads are never rendered adherent to the eyelids or eyelashes by secretion. When it is necessary to remove them, they drop off at a touch.

After forty-eight hours, I open the eye operated on, when, if all be well, I feel justified in assuring the patient that the ultimate result is secure, and I release the eye which has not been operated upon. The bandage is then placed obliquely, and it retains its position as well as before. After this time, the vaseline is no longer required, and the pad is only wetted. After the lapse of a week, the pad itself may usually be discontinued, and the eye protected only by a shade.

If any cortical matter has been left within the eye, I commence about the fourth or fifth day the instillation of atropine; using it in weak solution, say, of half a grain to the ounce, and combining with it two grains of cocaine. This may be continued, without fear of surface irritation, until all soluble matters are absorbed.

In a considerable proportion of instances it will be found, when vision is accurately tested in about six weeks after the operation, that it is diminished by the presence of delicate films in the pupil. When the iris is perfectly free and movable, and when the films are only shreds of the anterior capsule, or are formed by the unbroken posterior capsule, I think the best practice is to divide them with two needles, after the manner first contrived and recommended by Sir William Bowman. The needles for this purpose should be new and carefully selected, so that their points make a sufficient opening to allow free play to their shafts; and, if they are oiled in the manner already described when speaking of the knife, there will be scarcely any escape of aqueous humor, even when they are withdrawn. If pupillary obstructions are more dense, if they are the results of iritis subsequent to the operation, and especially if the lower margin of the pupils be at all drawn up toward the wound, I am no longer satisfied with needles, but

prefer to divide the films; and, in the case last mentioned, the iris tissue also by the capsule scissors. For this purpose I use scissors of the pattern which I designed some time ago. I make the necessary small incision in the centre of the cicatrix of the extraction wound and divide the films, and, when necessary, the iris, in a direction vertically downward. By this proceeding all dragging is at once relieved. I have heard of such operations being followed by disastrous consequences, but I have never seen an example ; and, on the whole, I think that an eye in which capsule has been divided, so that free communication exists between the aqueous and vitreous chambers, is left in a better position than one in which this procedure has not been required. It is quite conceivable that a pectous condition of the lens capsule, by which the transudation of nutritive fluid is diminished, may be at least one among the causes of cataract, and such a condition, after extraction of the lens, might in the same way promote increase of tension. If an eye from which the lens had been removed were threatened with glaucoma, the first thing to do would be to make a free opening in the posterior capsule, and I never regret having to do this as part of the original operation. * * * —*Brit. Med. Jour.*

CORRESPONDENCE.

LOUISVILLE, KY., Jan. 11, 1889.

DR. ADOLF ALT, St. Louis, Mo.:

MY DEAR DOCTOR.—I have just read an eulogy of Dr. Elkannah Williams, in the November number of the JOURNAL OF OPHTHALMOLOGY. Unwilling to draw a single ray from the lustre of his renown, I am, nevertheless, impelled by a sense of the importance of the truth of history, to correct two very striking errors; in 1876 he was not Chairman of the Section on Ophthalmology in the International Medical Congress; he did not receive the degree of M. D. from "the Medical College of Louisville, Ky." The Chairman of the Section of Ophthalmology in the International Medical Congress of 1876 was Robert Brudenell Carter of London. The Vice Presidents were Wm. Thompson, of Philadelphia, and Henry W. Williams, of Boston. Dr. Elkannah Williams graduated at the University of Louisville, which has never been known by the title of the "Louisville Medical College," nor "the Medical College of Louisville." There were two medical colleges here at that time; one the Kentucky School of Medicine, the other the Medical Department of the University of Louisville. In the latter institution Dr. Elkannah Williams graduated in March, 1850. In a biographical sketch written by Dr. Williams himself (Biographical Dictionary of American Physicians and Surgeons, edited by Wm. B. Atkinson, Philadelphia, 1880, second edition), it may be seen that he practiced in Indiana for the next two years ensuing the date of his graduation. "In the spring of 1852 he settled in Cincinnati to engage in the regular practice of medicine. In November of that year he sailed for Europe, for the purpose of studying Ophthalmology. In the spring of 1855 he returned to Cincinnati and com-

menced the practice of Ophthalmology and Otology." Dr. Williams of Cincinnati, though a frequent contributor to the periodical literature of the day, did not leave any permanent work; on the other hand, Dr. Henry W. Williams, of Boston, is the author of several books, the most important of which is a Systematic Treatise on Diseases of the Eye. It has long been claimed that Dr. Henry W. Williams, of Boston, was the first regularly educated specialist in ophthalmology in the ranks of the medical profession in America. Dr. Williams, of Cincinnati, was elected President of the Ophthalmological Congress which met in New York, in 1876, and which was a distinctive organization of specialists. Out of the score of more or biographical sketches written since the death of Dr. Williams, none of them have been free from error. The claim of his having introduced the ophthalmoscope to the surgeons of the Royal London Ophthalmic Hospital is not true. Fresh from Berlin, he entered the London Institution with the newest form of instrument in his pocket, and delighted the staff with his superior skill in its use. I am, dear doctor, with great respect,

Your obedient servant,

DUDLEY S. REYNOLDS.

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23 MERRION SQUARE, DUBLIN, JAN. 13, 1889.

MY DEAR DOCTOR.—May I ask you in your next issue to correct an inaccuracy which occurs in reference to the symptom of dyslexia in my paper which appeared in your December number. I make the statement that "in every instance the lesion was on the left side of the brain." It should be in all the cases except in Brun's case the lesion was on the left side of the brain. In his case there was atheromatous degeneration of most of the large arteries of the brain and softening of the *right* external capsule and lenticular nucleus, while the left side of the brain was normal. The examination of the brain here was wholly macroscopical, but so far as it goes it tends to lessen the value of dyslexia as a localizing symptom.

I am yours very faithfully,

H. R. SWANZY.

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CASES OF CONGENITAL TUMOR.

BY ADOLF ALT, M. D.

The literature of congenital tumors on the eye, eyelids and the orbit is not so superabundant that the description of the following interesting cases seems to need an apology.

I. *Large cavernous tumor of left upper lid.*—H. R., æt. six years, a healthy boy, was brought to my office Sept. 1, 1886, on account of a swelling on the left upper lid. The father stated, that when the child was born a bluish tumor of varying size was seen to occupy the outer third of the left upper lid. When the child sucked, or coughed he observed that this tumor increased in size and became more blue. He thought he had noticed a slow, but steady growth, and was now thoroughly alarmed.

On examination, I found a bluish semi-soft swelling under the skin of the left upper lid, about the size of a small walnut, which hung over the lid margin. By pressure this tumor could be emptied, and on stooping or coughing it filled up until the skin was shining. My diagnosis was, that we had to deal with an angioma, and probably, a cavernous venous tumor. I proposed its removal and obtained the consent of the father at once.

On the same day, after the patient had been anæsthesized, I enucleated the tumor, which did not reach down into the orbital tissue. The bleeding was of no consequence whatever. I closed the wound with a few stitches which were removed on the third day. No relapse has occurred. The tumor was a cavernous venous angioma.

II. *Teleangiectasia of left lower lid and orbit.*—March 10, 1887, L. R., a baby girl, not quite four months old, was brought to my office with the following history: After birth a small nodule had been noticed in the left lower lid, but was thought of no importance, until two months ago, one day it seemed to become suddenly very much larger. The mother then thought the child had struck her eye with the fist. A leech was then applied to the tumor and this seemed to have the desired effect of reducing it in size. Six days before the child was brought to see me, it had again seemingly become suddenly much larger, and once more a leech was applied to it. This time, however, the result was not the same as formerly.

When I saw the child the whole of the lower lid was very much swollen, and discolored by ecchymosis. Pressure did not reduce this swelling, nor did it seem to cause the child any pain. There was a diffuse fluctuation, and nowhere could I feel any partciular resistance, pointing to the seat of the tumor. I advised to leave it alone for some days; until the blood should have become absorbed, in hopes to be then better able to make a diagnosis. Five days later I saw the child again. The skin was not as tense then and fluctuation was so marked that I thought that there was an abscess and made an incision. No pus, and but very little blood escaped. I now came to the conclusion that there must be a tumor in the lid, but of such a soft tissue that its lack of resistance produced the feeling of fluctuation on alternate pressure. I therefore decided to remove it, and this was done on the 24th of the same month under chloroform. After incising the skin, I found a soft lobulated tumor the size of a filbert which seemed to end at the orbital margin. It was carefully enucleated, there be-

ing but little hæmorrhage and the wound was closed with sutures. It appeared like a lipoma. Under the microscope only its true nature was recognized as that of a teleangiectasia. The wound healed kindly and the lid appeared after a few days to be of a normal size. To my great astonishment, however, the child was again brought to me five weeks after the removal of the lid-tumor in apparently as bad a condition as before. The question was now, of course, whether this was a relapse, a thing I have never seen in these cases, or whether a similar tumor had existed in the orbital tissue and had now grown rapidly forward.

On May 10, I again operated on the child. I now found a tumor of the same nature as the one I had removed from the lid, within the orbit. It was, however, much larger than the lid-tumor, being the size of a small walnut. Healing took place without an accident, and no relapse has occurred.

III. *Adeno-chondro-lipoma of the conjunctiva.*—W. W., a boy, æt. $1^1/_2$ years, was brought to my office April 15, 1885, on account of a small tumor on the right eye. The parents had noticed this tumor a few days after birth. They thought that it had been slowly but steadily growing ever since.

I found a roundish tumor of a yellowish white color, situated on the sclerotic of the right eye. It commenced at the corneo-scleral margin corresponding to the vertical meridian and ran downward toward the retrotarsal fold. Its shape was that of a flat pea, and it was covered by hyperæmic conjunctiva. It could by pressure be moved somewhat to and fro upon the sclerotic, and although not easily, yet sufficiently enough to show that there was some tissue intervening between it and the sclerotic. The periphery of the cornea just where the little tumor joined it had a whitish discoloration. The tumor was easily removed, and the wound healed gently. No relapse occurred.

Under the microscope it was found to consist to the greater part of glandular tissue of the acinous type. To one side lay a round and firmer body which consisted solely of cartilage tissue of the embryonic type. Here and there was a small

amount of fat-tissue interposed between the other tissues.

IV. *Teratoma of the left upper lid near the punctum lachrymale.*—J. G., æt. 7 years, was brought to my office June 6, 1888, on account of a round tumor which had been on his left upper lid ever since he was born. It had not apparently grown any, yet it was unsightly and interfered with the closing of the lids.

I found a hard, white, round tumor sitting with a broad base on the intermarginal space of the left upper eyelid, about the size of a hemp-seed. It was not possible to move it, and it seemed, so to speak, deeply rooted in the tissue. Its situation was just above, and a little outward from the lachrymal punctum, which was pushed out of contact with the conjunctiva by the presence of this tumor. To the feeling the tumor appeared as hard as cartilage tissue.

I removed it with the scissors and with little trouble.

V. On November 30, 1888, J. B., æt. 27 years, came under my care on account of an abscess of the left cornea. He had, moreover, in appearance identically the same tumor on the same part of the left upper lid as the one described in case IV. It had been observed to exist at birth and had but little grown since. The only difference between it and the tumor in case IV. was that it had a broader base, and there was a fold of swollen conjunctiva running under it back to the semilunar fold. I removed the tumor with scissors on Sept. 4. The wound healed kindly and the conjunctival fold has since disappeared.

The microscopical examination, also, has proved these two tumors to be of the same nature. They consist of densely packed connective tissue fibres with acinous glands, a large quantity of striated muscular fibres, hair, and some fat tissue.

TWO CASES OF ORBITAL SARCOMA IN CHILDREN.

BY ADOLF ALT, M.D.

CASE I.—G. G., was a stout boy, æt. $1\frac{1}{2}$ years, when I first saw him, April 5, 1886, in consultation with Dr. Laidley of this city. The previous history of the child was, that he had meningitis when about six months old. A few weeks ago the eyelids of the left eye were red and inflamed. This condition, however, soon disappeared again. About ten days ago the mother noticed for the first time that the left eye protruded and deviated outward. These conditions have since rapidly become worse. He, furthermore, has been wanting to sleep continually for some days and did not care to play. There was also some bronchial trouble.

The family history being inquired into, I found that the child's mother had a tumor the size of a goose-egg in the right axilla, that his grandmother had died of cancer, and that an aunt was now under treatment for cancer of the uterus.

When I saw the child first, the left eye was pale, and protruded considerably. There was divergent strabismus and almost total inability to move the eye toward the median line.

The next day we made an examination under chloroform. Although it was impossible to palpate a tumor in the small orbit, yet the eye could not be pressed back nor inward. There was, moreover, optic neuritis. From these conditions, and especially considering the family history, I thought I was correct in assuming the probability of a tumor growing in the orbit which should be removed. From the probable situation of the tumor I hoped to be able to remove it without removing at the same time the eyeball, but I told the parents that, if necessary, in order to clean out the tumor better, I might have to remove the eye.

After this consultation we decided on operating both mother and child at the same time. This was done April 8.. The mother's tumor, which was removed by Dr. Laidley, proved to be a small spindle-cell sarcoma.

When beginning the operation on the child, I first divided the internal rectus muscle and tried to get into the orbit and at the tumor. This was, however, impossible. I therefore enucleated the eyeball. After having done so, a smooth tumor could be felt running back on the inner wall of the orbit backward into the orbital fat. Before, however; reaching the tumor, and in cutting down upon it, I opened a small cavity filled with mucoid material, which probably was a small cyst. Behind this, and firmly bound down to the orbital wall, I now felt the tumor, which was of the size of a large hazel-nut. After having removed it, the bone underneath was found to be rough. The operation was performed with antiseptic precautions and a sublimate-dressing applied.

Everything went on nicely. The wound healed rapidly, but just when I was about to discharge the patient an erysipelas of the head and face developed on April 20, to which the child succumbed on May 3, after having repeatedly seeemed to rally.

The tumor was a small round-cell sarcoma.

Case II.—On December 25, 1888, I was for the first time consulted by the father of G. K., a stout boy, æt. about 2 years, on account of the protrusion of the child's left eye. This protrusion had been noticed only three weeks previous to this consultation, and the child had been treated for it and the statement had been made, that there was surely no tumor. The family history was good.

On examination I found a considerable degree of exophthalmus forward and downward. The motility inwards was also somewhat impaired. There was but slight congestion of the conjunctival blood-vessels, and the lids could yet be closed over the eyeball. While the child was under the influence of chloroform I tried to palpate the orbital contents, but could not do so on account of the narrowness of the or-

bital cavity and the tenseness of the conjunctiva. The eye could not be pressed backward. With the ophthalmoscope the disc was seen to be grayish and indistinct in outline; the retinal arteries were just barely visible, the veins were broad but pale.

I told the father that in all probability there was a tumor in the orbit (perhaps of the optic nerve), pushing the eye forward, and that this tumor and probably the eye with it would have to be removed. His consent was not given immediately.

However, only four days after, on December 29, I was sent for with the instruction to bring everything necessary for the operation.

The condition was now altered in so far as the eyeball was inflamed, the cornea had sloughed, and the patient was very restless at night.

As matters stood, no attempt was made to save the eyeball. I enucleated it as soon as the patient was anæsthetized. After the eyeball was removed a soft tumor was found to lie in the orbital tissue out- and upward, and to extend almost to the apex of the orbit. I removed the tumor, the bulbar conjunctiva and orbital contents almost totally. There was considerable bleeding, yet the child was none the worse for it. Everything went on favorably till the child was discharged from my immediate care.

The tumor proved to be a round-cell sarcoma with portions of a myxomatous character.

Six weeks after this apparently clean operation, (I had removed a considerable quantity of healthy orbital fat from behind the growth) I saw the patient again. I found now that the tumor had grown large enough again to fill the whole orbit, to press forward both lids, and even to protrude to some extent between them. The child showed, further, cerebral symptoms, and I declined to interfere by another operation.

If ever I had another occasion to see a case of orbital tumor in a child which appears to be malignant I shall insist on the removal of the whole of the orbital tissue within the periosteum, or do nothing.

TRANSLATION.

ON THE ANASTOMOSES OF THE POSTERIOR CILIARY BLOOD-VESSELS WITH THOSE OF THE OPTIC NERVE AND RETINA.

BY CONRAD RUMSCHEWITSCH, M.D.

[*Zehender's Monatsbl. f. Augenhlkde.*]

Leber, in his celebrated work on the arrangement of the circulation and nutrition of the eye, says: "Aside from the connection between the system of retinal vessels and the one of ciliary vessels at the optic nerve entrance, these two are perfectly separated, and there is especially no connection between the two systems at the anterior end of the retina, the ora serrata." [1]

The anastomoses in the area of the optic nerve entrance are of a decidedly capillary character,[2] and although the blood-vessels coming from Zinn's ring do not only spread into the optic nerve, but also into the neighboring parts of the retina, they are so narrow and so short within the retina, that according to Lebér, they cannot be seen with the ophthalmoscope. In stating this to be the general rule, Leber does not deny the possibilitiy that larger blood-vessels from the scleral ring may enter the retina, and reports the case, which has been de-

[1]Graefe & Saemisch, p. 308, vol. ii.

[2]Graefe & Saemisch, p. 547, vol. v.

scribed by H. Mueller.[1] We find, however, a passage in Loring's paper concerning cilio-retinal blood-vessels[2] which he observed by means of the ophthalmoscope, and Schleich[3] reports many such cases in which he observed such blood-vessels in conjunction with posterior cones. Similar cases are those of Benson[4] and one of Nettleship,[5] although the last mentioned case is a doubtful one on account of the fact, that the patient suffered from a papillitis, and, thus the eye was in a pathological condition.

In the year 1883, Birnbacher[6] described a case of embolism of the central retinal artery in which there also existed cilio-retinal blood-vessels. The existence of the latter was assumed, because when the other arteries were perfectly empty, two arteries coming from the temporal margin of the papilla optica (Art. maculares) and running into the region of the macula lutea remained undisturbed. Moreover, there was an area in the centre of the field of vision, measuring 15° at its largest diameter, in which sight was preserved. Birnbacher explained this, by assuming that these two blood-vessels started from the arteria centralis. This assumption was confirmed to a certain extent by the anatomical examinations of Hoffmann.[7] In beasts of prey, whose eyes are abundantly supplied with short posterior ciliary arteries, many of these are divided into two branches within the sclerotic or just before bending over into the choroid, the smaller one of which enters the optic nerve. Hoffmann found such cilio-retinal blood-vessels also in the squirrel and horse ; they are less well developed in ruminants. The veins may be arranged in an analogous manner.

[1]Arch. f. Ophth., vol. ii, p. 8.

[2]Arch. der Ophth. and Otologie, vol. ii, p. 163.

[3]Contributions from the Ophth. Clinic in Tuebingen, vol. i, p. 130.

[4]Ophthalmic Hospital reports, vol. x, p. 3.

[5]Ibidem, vol. ix, p. 2.

[6]Centralbl. f. prakt. Augenhldke.. p. 207.

[7]Arch. f. Ophth., xxix, 2, p. 45.

Schnabel and Sachs[1] give a different explanation of the preserved function of a certain part of the retina in embolism of the central retinal artery. Concerning the cilio-retinal vessels, they are of the opinion, that their existence would be a contradiction of embryological facts. The existence of such blood-vessels is, moreover, not proven stisfactorily, the less so, since neither H. Mueller nor Nettleship have seen the origin ot such blood-vessels. Yet, the symptoms which we often have occasion to observe in embolism of the central retinal artery give good cause for the assumption of cilio-retinal blood-vessels.

Whenever we find in a retina which is generally milky and pale, a certain portion which has retained its normal color and corresponding to it a certain portion of the visual field which has preserved its normal function, and furthermore within this area a blood-vessel of normal calibre which comes from the margin of the optic nerve—it seems to be pretty safe to assume in such a case the existence of the cilio-retinal blood-vessel. I had occasion to see such a case three years ago, yet I did not at once adopt the view that there was a cilio-retinal blood-vessel. The patient, however, never returned and the case for me has remained an unexplained one.

That it is well to be careful in the diagnosis of similar cases is shown in the following case of Hirschberg.[2]

At the first examination the diagnosis of ebolism of the central retinal artery and the existence of a cilio-retinal artery seemed possible. But nine days after, this artery became also invisible, which proved of course, that the assumed cilio-retinal blood-vessel was simply a branch of the central retinal artery, which sprang at an acute angle from the part of this artery which had become obliterated. This case proves simply that we have to be careful in our diagnosis, but it does not prove anything against the existence of cilio-retinal blood-vessels in the eye.

[1]Arch. f. Augenhlkde., vol. xv, p. 11.

[2]Centralbl. f. prakt. Augenhlkde., 1885, p. 353.

Birnbacher[1] describes a case, in which he made an anatomical examination (the eye was perfectly normal). From an artery, which lay in the choroid near the optic nerve entrance and was 52 μ broad, a vessel of arterial character branched off which after a short distance, went into the papilla and bending over the choroid and outer layers of the retina, entered the nerve fibre layer of the retina and ran within it in the direction of the macula luta. This blood-vessel was 40 μ broad, and considering, that the central retinal artery was 123 μ broad, it is plain that this blood-vessel could be seen easily with the ophthalmoscope. In this case, then, there existed undoubtedly a cilio-retinal vessel.

The possiblity of the existence of an analogous vein was first proven by Elschnig.[2] The anomaly was observed in the left eye. The papilla was encircled by an irregular yellowish ring, whose breadth equaled one-fourth of the diameter of the papilla. Outward and downward (upright image) from the central vein, a blood-vessel ran which was about equal in breadth to the main branches of the central vein. This blood-vessel gave off several thin branches which ran into the retina, and then it disappeared beneath the yellow ring mentioned above. Elschnig came to the conclusion that the blood of the choroid was emptied into the central retinal vein by means of this blood-vessel. The inferior temporal retinal vein was, then, in this case a cilio-retinal blood-vessel.

A short time ago I had occasion to make a similar observation in the healthy left eye of an individual 30 years of age. The eye had M 1, 5 D. and $V = {}^{20}{}_{xx}$. Inward from the papilla there is a crescent of a breadth less than one-fourth of the diameter of the papilla. Over the centre of the papilla the superior papillary artery (Magnus) begins, which is tolerably long, since its division into the superior nasal artery and the superior temporal artery takes place only after it has entered the retina. The inferior papillary artery does not exist, and

[1]Arch. f. Augenhlkde., xv, 3, p. 392.

[2]Arch. f. Augenhlkde., xviii, 3, p. 295.

the inferior nasal and temporal arteries start from the centre of the papilla as independent arteries. The veins run in the opposite direction. While yet within the optic nerve the central retinal vein is divided into three branches, of which one, which runs downward, the inferior papillary vein, is divided into the inferior nasal vein and the inferior temporal vein. Of the other two branches which run upward, one is the superior temporal vein, which has a perfectly normal course; the superior nasal vein, however, runs over the papilla and the crescent and having reached the edge of the latter suddenly disappears. It is clear that this blood-vessel which carries blood to the central retinal vein, does not bring it from the choroid but from the retina, or that here the superior nasal vein is a cilio-retinal blood-vessel.

The cases of Elschnig and my own are very similar and prove satisfactorily, that there are not only the capillary anastomoses between the choroidal and the retinal systems of blood-vessels which Leber has extensively described, but, furthermore, as he too assumes, there are anastomoses by means of broad blood-vessels, viz. venous retinal blood-vessels of the second order.

REPORT OF THE CONGRESS OF ITALIAN OCULISTS HELD AT NAPLES, SEPT., 1888.

(*From Hirschberg's Centralblatt*).

CHAIRMAN: DEVINCENTIIS.

Morano.—Therapeutics of affections of the lachrymal sac. The author is convinced that incisions into the lachrymal sac, for instance, by means of Stilling's knife, cause only a more severe contraction. He recommends his dacryocystotom, which has the olive-shape point of Weber's knife, but is considerably broader at the base. He considers it as the main point, that, by the vertical introduction of his knife the cupola of the sac is slit at the same time with the lower wall of the lower canaliculus. Through this opening he treats the lachrymal sac with nitrate of silver in substance, and besides introduces probes.

During the discussion Angelucci recommends to have this dacryocystotom made of different sizes. Tornatola thinks Tartuferi's instrument is valuable (*cf. Centralbl.* 1885). Bono speaks for the obliteration of the sac in certain cases.

Angelucci.—Investigations concerning the visual functions of the retina and the brain.

1. The physiological reaction of the retina. After having given a historical review, the author described the changes which can be seen macroscopically in the retina, when influenced by light or darkness, according to his own observations. From these he tries to form conclusions with regard to the theory of light—and color-perception. Young's hypothesis, as well as Hering's, is unsatisfactory. The descent of the pigment along the elements of the retina reduces the glare of the strong light by absorption. The author tries to establish a re-

lation between the phenomena of successive and simultaneous contrast, and the changes in the form of the elements of the retina.

2. The structure and function of the optical conductive apparatus. The author confirms from his own studies the semi-decussation of the optic nerves in the chiasma of the rabbit, dog, and in man (in union with Tornatola). He then speaks of the roots of the optical tract, and gives preference to Weigert's method as against Stilling's. Against Stilling he declares that the optic tract does not give off any fibres to the pedunculus. and states that the strong bundle running backwards from the tract in the region of the external corpus geniculatum is not, as Stilling describes it, of a nervous, but of a connective tissue character. Finally the author ascribes the same qualitative function to the pulvinar, the corpora geniculata, and the corpora quadrigemina. This is also confirmed pathologically, at least in so far as a focus localized in any of these centres, always produces homonymous lateral hemianopsia.

3. The visual qualities of the cortex of the brain. The author describes experiments on pigeons, rabbits and dogs, and comes to the conclusion that the act of seeing is not dependent in its totality on the integrity of the cortex. In common with others he finds that the reductions in sight following a lesion to the hemispheres is not due to a direct injury of the visual centres, but to secondary influences. He arrives at this conclusion from the fact that injuries to different other portions of the brain, which have nothing to do with the act of seeing, will cause passing reductions of vision. He finally designates the mesocephalic ganglia as the seat of the sensitive act of vision, and the cortex of the occipital lobe as the seat of the intellectual act of vision. Only the mammalia have intellectual vision. He then gives the history of 42 cases of lesion of the cortical visual area in man which are reported in literature. The author speaking of word-blindness tries to subdivide it in a way similar to the subdivisions of aphasia. He differentiates between: 1, sensorial word-blindness, which is

conjoined with loss of the optical memory; 2, word-blindness from motor-lesion with aphasia; 3, word-blindness due to a lesion of the conducting apparatus between the optical memory-centre and the centre for articulation. * * *

* * * *Scimemi.*—On neuritis optica due to a cerebral tumor. Several cases with autopsies. The author says it is unnecessary to ligate the optic nerves during the autopsy, as Leber recommended. The enlargement of the inter-vaginal space remains visible, even when the fluid has escaped.

The author injected salt-solution into the arachnoidal space of rabbits when under the influence of curare. The experiments were arranged similarly to those of von Schulten. He found passing evidences of stasis in the papilla after every injection. The same resulted from injections ot agar-agar with india ink (Deutschmann). Since the choked disc is of an inflammatory nature, the author finally confesses his belief in Leber's theory, that the hydrocephalic fluid has an irritating influence upon the optic nerve, and especially on the papilla, but he could not produce a choked disc whether he injected tubercular masses into the cranium (Deutschmann), or mercury (Manz); he succeeded, however, in causing neuritic symptoms by injecting a small drop of mercury into the intervaginal space. Yet, this does not prove that in a case of cerebral tumor, the choked disc is produced according to Leber's theory.

Scimemi.—On corneal astigmatism after extraction of cataract. The author has made ophthalmoscopic measurements of 146 eyes, and finds that the corneal astigmatism after extraction is due partly to an increase in curvature in the horizontal, and to a decrease in the vertical meridian. He sees the cause of this result in the action of the recti muscles, and he thinks further, that the shifting forward of the corneal wound-lip is due to the same cause.

In the discussion Angelucci states that the corneal astigmatism after extraction is never regular. He, therefore, recommends Placido's disc for the examination, as well as ophthalmometric measurement in four different meridians and with prisms of different angles.

Moauro shows specimens of an enucleated eyeball with retinal cysts and capsular cataract.

During the discussion Falchi states that there are two kinds of cells found in capsular cataract, viz., connective tissue cells with great nuclei and epithelial cells. * * *

* * * *Addario.*—1. Recommends an antiseptic hood made of silk over which the bandage for the eye is applied.

2. In lachrymal troubles he recommends to scrape out the lachrymal sac by means of a Hebra's spoon through the slit canaliculus.

To this Devincentiis states that such a procedure is only indicated when there are fungoid vegetations in the sac, never against fibrous strictures nor in acute dacryocystitis.

Falchi.—On non-congenital hydrophthalmus. Two cases described microscopically. The thinnest parts are at the periphery of the cornea and around the optic nerve entrance, that is, at the site of the two large lymph-channels of the eye. Hydrophthalmus begins with iritis and closure of Fontana's spaces, followed by secondary glaucoma.

Addario.—Bacteriological studies of five chalazia. The tumors were neither soft nor suppurated. Neither the cultures from fresh sections, nor those from the hardened specimens showed any micro-organisms. In suppurated foci, however, the author found the staphylococcus pyogenes albus.

Gallenga.—1. Sclerosing fibroma of the lids. A girl, æt. 19 years, had an enlargement of the left upper lid for three years, causing it to hang down over the cheek. Within there was a hard tumor over which the skin could be moved. This tumor weighed when removed 13.5 grammes. Microscopically it consisted of sclerosed connective-tissue of a hyaline appearance. There were several deposits of lime and some lamellæ of genuine bone-tissue ; no osteoblasts were found at their edges. The tumor seemed to have sprung from the fibrous tissue of the tarsus.

2. A case of congenital tumors of the palpebral conjunctiva and the retrotarsal folds. The tumors showed organic muscular fibres and acino-tubulous glands. The author had de-

scribed similar cases before and called attention to the one described by Boegel (1886).

Gonella related that he had observed a case of dermoid of the conjunctiva near the outer canthus which contained organic muscular fibres.

Devincentiis has also seen such a case and several cases of congenital cysts which were combined with changes in the excretory ducts of Krause's glands.

Angellucci thinks that the cases described by Gallenga might be myómata and of later origin.

Gallenga says that the formation of glands points to their congenital character.

Devincentiis.—1. Demonstrates by drawings two cases of intra-ocular cysticerus, and microscopic specimens of a third case.

2. Specimens of hyaline degeneration of the contents of the eyeball in a case of anterior scleral staphyloma.

3. A modification of the operation for trichiasis by transplantation of the ciliary margin.

4. Extracted cataract of a Polish lady, æt. 108 years. In the part of the anterior capsule which he had removed, he found one endothelial cell with karyo-kinesis. * * *

* * * *Bono*—1. Electrolysis of lymphatic œdema of the lids.

2. He recommends as operation for Trichiasis the method of von Wecker with partial tarsoraphy.

3. He praises sozo-iodol in ophthalmic therapeutics.

4. He states that parenchymatous keratitis is always syphilitic, but that mercury is not always well borne in such cases. *Scimeni* says the very reason for the latter fact is that the disease is not always of a syphilitic nature. * * *

* * * The next congress will meet at Pisa, September, 1890.

ABSTRACT OF CLINICAL LECTURE ON THE USE OF GLASSES IN HYPERMETROPIC CHILDREN.

BY N. C. MACNAMARA, F. R. C. S.,

Surgeon to the Westminster Hospital, and the Royal Westminster Ophthalmic Hospital.

The subject I wish to direct your attention to is the desirability of ordering glasses to be constantly worn by children suffering from absolute hypermetropia. By absolute hypermetropia, we mean that a person having an error of refraction from this cause is unable to read the test types numbered 6, at a distance of 20 feet, or about 6 metres; in other words, he cannot come up to the standard of normal vision or to $\frac{6}{\text{vi}}$, distance from type, number above type.

The question is, are we to order spectacles for hypermetropic children; if they are ordered glasses, are they to be worn constantly; and lastly, do cases of hypermetropia ever improve under proper treatment?

In the first place I would put on one side all cases of hypermetropia complicated with strabismus, a class of cases the consideration of which we may defer to another lecture. I would refer now to the circumstances of children who, after reading or writing for some little time, especially by gas or lamp light, complain of their eyes becoming very irritable, so much so as to prevent them from continuing their work with any comfort; these children frequently also suffer from headache after reading for an hour or so. We may find on examing the eyes, let us suppose of a boy 8 years of age, with symptoms such as those to which I have referred, who can

only read $^6/_{XII}$ with either eye, that possibly after considerable effort he can just make out $^6/_{IX}$, but is quite unable to decipher letters marked VI at a distance of twenty feet. With convex 1.50, D. (dioptrics), this lad can distinctly see $^6/_{VI}$, and I of Snellen's small types at 12 inches; the patient, therefore, is obviously suffering from absolute hypermetropia. (See Donders' "Accommodation and Refraction of the Eye," p. 242.) When this boy's eyes are completely under the influence of atropine, with +3.5 D. he can read $^6/_{VI}$ with both eyes. We therefore add the amount of his latent and manifest hypermetropia together, and order him spectacles of half the combined figures, or in this case +2.5 D. But then comes the question, is the patient to wear these glasses constantly?

Donders, in his work above referred to, page 282, observes that "in youth if relative or absolute hypermetropia exists, then, notwithstanding every effort of accommodation, distant vision is not perfect, we must consequently assist it with glasses, and order such patients always to wear their spectacles." He adds "when patients can read $^6/_{VI}$ without glasses, though hypermetropic, we should not press spectacles to be worn constantly, but when older such patients will always have to wear glasses." These rules, I believe, still guide most surgeons when ordering glasses in cases of absolute hypermetropia. I am of opinion, however, that we may often do much to improve the sight of children suffering from even absolute hypermetropia by allowing them, if necessary, to wear glasses while at work, but not for distance, and when reading and writing to discard their spectacles to a considerable extent. My reason for holding this opinion is based on the fact that by far the majority of young children are hypermetropic, and a very large proportion of these children grow out of the hypermetropia and become emmetropic; but I think this change may possibly be delayed, if not prevented, by the constant use of spectacles.

Donders (page 245) endorses a statement made by Jaeger to the effect that the eyes of nearly all newborn children are myopic; but he remarks that the myopia soon disappears, and

gives place to emmetropia. Jaeger found that no less than 78 per cent of infants are myopic, 17 hypermetropic, and 5 emmetropic. Donders adds: "I have in the fifth and sixth, and sometimes in the fourth year, demonstrated considerable hypermetropia, and have never seen this condition disappear later in life." In 1879, however, Ely re-opened this question; he found that of 154 children, when fully under atropine, no less than 108 were hypermetropic. Königstein discovered that without exception 300 newly-born infants were all hypermetropic. Lastly, Dr. Horstmann, of Berlin, states that of 50 infants, new-born, 88 per cent were hypermetropic; of 50 children from 4 to 6 years old, 86 per cent were hypermetropic; of 50 children from 4 to 6 years old, 88 per cent were hypermetropic.

I have for some years past examined a considerable number of infants and children when under the effect of atropine, and I can fully endorse the correctness of Dr. Horstmann's figures. In fact, hypermetropia is the most frequent condition of the eyes of children, depending, I think, upon the formation of the orbital fossa and of the eyeball, which are relatively flatter to the rest of the skull in childhood than they are when the normal growth of the head is completed. This being the case, if from bad hygienic conditions of body or of eyes, a child's development is arrested, his eyes will retain the hypermetropic condition of childhood. The eye, like any other organ of the body, unless called upon to struggle with the other members for existence, suffers in the long run to a very remarkable extent· and a fault in the form of the eyeball thus acquired by the parents is frequently intensified in their sons and daughters. Supposing, therefore, parents insist upon their children, say, from 4 to 6 years of age, being sent to school, it is obvious that some 88 per cent of them are hypermetropes; if in robust health, such children overcome their error of refraction, if it be an error, by means of increased accommodation; if weakly, however, such children cannot keep the necessary forced action of the ciliary muscle; it gives way, and in their efforts to get more work out of it arises the irritability of the eyes and headache from which they suffer.

Doubtless we may alleviate the symptoms complained of by such patients, and order them convex glasses, which will relieve the ciliary muscle from overstrain ; but is it not possible, that in doing this, we fix the eyeball in its flattened condition—in fact, perpetuate the state of hypermetropia? For although this condition of the eyeball exists in 88 per cent. of young children without the employment of lenses, by far the majority of them grow up to be emmetropic. I think this hypermetropia is especially likely to become permanent in the case of rachitic children, because the sclerotic is one of the connective tissue series, and, like the bones and other members of the series, often suffers in rickets.

My idea, therefore, is that, unless in cases of hypermetropia complicated with strabismus, we should, if practicable, rather than order children glasses to be worn constantly, do what we can to place our patients in a condition where they will not require to use spectacles, and by exercise and the amusements of country life, develop their eyes and bodies in a healthy manner. The less they have of books until they are eight years of age the better. If they must go to school, let them learn to play; there is more chance of their being behindhand in this respect at the present day than in the matter of reading and writing.

This idea is not a mere theory; I have a number of recorded cases, of which the following is not an overdrawn picture showing the advantage that may follow treatment of this kind; but I refer particularly to this case because I was associated in it with Mr. Mackinlay, and we have, therefore, the independen observations of two surgeons as to the symptoms and the course which the case has run.

C. C. M., a well-built lad, tall for his age, who, when first seen on account of his eyes in October, 1882, was seven years old. He was then suffering from great irritation of his eyes after any attempt to learn his lessons. On examination it was found that in

October, 1882, his vision in right eye was $^{6}/_{\text{XXIV}}$ with $+1.75$ sph. c. $+1.50$ cyl. $= {^{6}/_{\text{XII}}}$. His vision in left eye was $^{6}/_{\text{IX}}$ with $+1.50$ D. $= {^{6}/_{\text{VI}}}$.

April, 1887, his vision in right eye was $^{6}/_{\rm XVIII}$ with $+1.50$ sph. c. $+1.50$ cyl. $= {}^{6}/_{\rm IX}$. His vision in left eye was $^{6}/_{\rm VI}$ with $+1$ D.

December, 1888, his vision in right eye was $^{6}/_{\rm XII}$, with $+1$ sph. c $+1.25$ cyl. $= {}^{6}/_{\rm VI}$. His vision in left eye was $^{6}/_{\rm VI}$.

This lad's sight, therefore, has in six years improved in the right eye without glasses from $^{6}/_{\rm XXIV}$ to $^{6}/_{\rm XII}$, and in the left from $^{6}/_{\rm IX}$ to $^{6}/_{\rm VI}$. In place of having been increased, the power of his lenses has steadily been reduced in strength. There is every reason to suppose that this improvement will continue during the next two years, the lad being now thirteen years of age. Our patient since 1885 has been at school, not only in a particularly healthy part of the country, but also under a gentleman who loyally carries out the great principle of equal culture for the body as well as for the mind. The lad is not only good at most games, but also an excellent shot at a rabbit. While C. C. M.'s eyes have been thus improving, it is interesting to note that his head has increased an inch and a half in circumference, and doubtless the depth of his orbital fossæ and his eyeballs have grown in an equal proportion. He has never used his spectacles except in school hours, and now frequently reads ordinary print without them.

This treatment was based on the opinion that hypermetropia is the normal, or at any rate the common, condition of children's eyes; but that, if healthy growth and development of all parts of the body progress in regular order, hypermetropia gives way to emmetropia or normal vision by the time a boy has reached his sixteenth or eighteenth year. On the other hand, children reared in our large cities are too often defective in their tissue-forming power; not a few are rachitic to a greater or less extent. Many of these children are almost from infancy set to work in gloomy rooms. Conditions such as these, with perhaps faulty food, that is defective in tissue-forming elements, especially in phosphate of lime, tend to prevent proper development, and therefore to perpetuate the hypermetropia. The use of glasses in such cases is, however, only palliative, and, I think, tends to obviate the necessity for

growth of the sclerotic and cornea, and therefore may rather fix the formation of the child's eye on into manhood, especially if glasses are constantly worn. As I have before remarked, we should, if possible, relieve such children from work and attend to their surroundings. But, supposing a child has reached his eighth year and has difficulty in his studies on account of hypermetropia, we may order him glasses so as to enable him to work, but he should only wear them when in school; and it is well, if practicable, to reduce the power of his lenses about every two years until the lad has ceased growing, when we can expect no further improvement. I am convinced that treatment of this kind may in some cases lessen the degree of hypermetropia, if it cannot completely overcome it. Hypermetropia is obviously a growing evil, due, it may be, in some measure, to the causes to which I have referred.—*British Medical Journal.*

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM. THURSDAY, JANUARY 31, 1889.

J. W. Hulke, F.R.C.S., F.R.S., President, in the Chair.

Exceptional Forms of Choroiditis.—Mr. Jonathan Hutchinson commenced his communication on this subject by remarking that the recognition of the peculiar and very striking forms of atrophy which followed on choroiditis was among the earliest achievements of the ophthalmoscope. Nor was it long afterward that the scattered form called "disseminate" was associated with syphilis. As soon as we obtained the means of recognizing the subjects of inherited syphilis during childhood and adolescence, it was observed that certain somewhat peculiar forms of choroiditis and choroido-retinitis were presented in young persons who had notched teeth, had suffered from interstitial keratitis, and some of whom were deaf. Next in course of time came the observation that in high degrees of myopia, in addition to the crescentic patches of denudation which were formed at the side of the disc, the choroid was liable to atrophy at the yellow spot, and in exceptional cases, irregularly at other parts of the fundus. Whether it could be said that any process of inflammation preceded the atrophy in thess cases of scattered changes in connection with elongation of the eyeball might be matter of doubt. Still later, a peculiar form of choroiditis was observed as occurring near to the disc and yellow spot in middle-aged or elderly persons, in which the changes consisted of very minute spots, which, as time went on, might coalesce and form patches. The first observations respecting this disease were made by Warren Tay, and published by Mr. Hutchinson. If to the forms of choroiditis above mentioned we added the secondary changes which

had been recognized as following on injuries, certain others in which recurring hæmorrhage occurred, and the rare instances in which tubercle had been observed, it was believed that the present state of our clinical knowledge in reference to choroiditis would be fairly stated. At any rate choroiditis had not been associated with any precision with other causes than those adverted to. Probably, however, all ophthalmic surgeons had recognized that there were examples of choroiditis met with in practice which it was difficult to assign to any one of the above groups, more especially that there were cases in which the conditions common in choroiditis disseminata were closely simulated, and yet the history of syphilis, whether acquired or inherited, was wholly wanting. These latter cases were, it was suggested, of importance in a double sense, that is, both as regards their treatment and because it had been thought by some that choroiditis disseminata was in itself almost a pathognomic symptom of syphilis, and it had been used, as notched teeth and keratitis were, as an important and conclusive aid to diagnosis. No attempt, as far as the author was aware, had been made to connect choroiditis with any other diathesis than that resulting from syphilis. Although we know that arthritic iritis was very common, no one had ever diagnosed choroiditis in such association; nor had it been asserted that struma, which was seen to be the parent of certain skin diseases, notably of lupus, ever stood in a similar relation to disease of the choroid. Especially it was to be noted that no form of choroiditis (always excepting the syphilitic) had been found to occur in association with inflammatory affections of the pia mater of the brain, such, for instance, as those which produced the adhesions that constituted the chief lesion in general paralysis of the insane. In all brain diseases we look carefully at the optic disc, but we do not expect to get any help in our diagnosis from morbid conditions in the choroid. Mr. Hutchinson next stated that he proposed on the present occasion to keep the subject within bounds by leaving wholly aside the common forms of the disease, such, for instance as the syphilitic varieties, those resulting from in-

juries, and those complicating myopia. He proposed to deal only with certain exceptional forms. It might be convenient, however, before proceeding, to offer the following list of the principal clinical groups of choroiditis, appending to each name of group a few brief words as to peculiar features and grounds of diagnosis. The choroiditis of myopia: Usually central around the disc or at the yellow spot, but sometimes occurring in scattered patches. A chief element in the diagnosis was the presence or otherwise of myopia in a high degree. Choroiditis senilis centralis. Tay's choroiditis: Always central and never causing the denudation of large areas; met with only in those past middle age, but occasionally simulated in syphilis. Choroiditis as a family disease: Various in form, often beginning in childhood, but sometimes not till middle life. Several members of the same family affected and the changes usually aggressive. Tay's choroiditis might sometimes occur as a family malady. Choroiditis in early periods of syphilis: Analogous to the exanthem eruptions of secondary syphilis, always in scattered patches and usually symmetrical; might be completely cured by treatment. Choroiditis in late periods of syphilis: Analogous to the tertiary or lupoid eruptions on the skin, always serpiginous and aggressive, often not symmetrical; benefited by treatment, but often not cured. Choroiditis of inherited syphilis: Either of the two preceding forms might occur in inherited syphilis: The periphery of the fundus was often alone affected. Choroido-retinitis simulating retinitis pigmentosa: This group included cases the result of blows, and many of those due to inherited syphilis. Almost always aggressive, usually attended by changes in the disc. Choroiditis without obvious cause: Usually but not always occurring in young adolescents, and, with an interval symmetrical, changes often serpiginous, as in tertiary syphilis ("lupus of choroid"), but sometimes disseminate. Not distinguishable from syphilitic cases but by the absence of specific history. Hæmorrhagic choroiditis: Very rare, seen in growing adolescents and in connection with sexual disturbances. Liability to repeated hæmorrhage into the choroid. Analogous to the

cases of recurring vitreous hæmorrhage, and sometimes associated with them. Choroiditis with iritis and cyclitis: Characterized by extending, with definite recurrences, through the whole life. Associated with chilblains. Choroiditis following blows in the eye: This was to be distinguished by scars caused by lacerations. It was a progressive form of choroido-retinal disorganization, always limited to one eye. Choroiditis consequent on the deposit of tubercle: No proof had as yet been afforded that tubercular disease of the choroid was aggressive. It might, however, easily be the fact that what he had termed lupus of the choroid was associated with tubercle. Under the head of choroiditis as a family disease, Mr. Hutchinson mentioned five series of cases from his own experience, and said that the number might easily be extended. In the first many children suffered, and the failure of sight was attended by failure of intellect and paraplegia. In the males there was remarkable growth of the mammary glands.

In another series two sisters suffered alike, and there was a history of proclivity to insanity. In another, three brothers were affected, and none until middle life, there being no other ailments whatever. These family forms were, it was suggested, to be compared with Kaposi's disease, retinitis pigmentosa, and other maladies which went to prove that under this law of inheritance, the children born to certain couples might possess by structural idiosyncrasy a weakness of certain tissues and organs which rendered them liable to disease at a certain age. Two cases of hæmorrhagic choroiditis were narrated, both the patients being young men. A comparison was drawn between these very rare cases and the somewhat more frequent ones in which recurrent hæmorrhages took place into the vitreous body. Examples of the latter had been brought before the Society by Mr. Eales, of Birmingham, and himself some years ago, and all their cases had occurred in young men. This limitation of the malady to one sex and one period of life had been confirmed by other observers. Mr. Hutchinson said he did not know of any case-records of hæmorrhagic choroiditis, but Mr. Nettleship had, in a reference to it, spoken of it as

a disease of young men. On the other hand, Mr. Power had recorded a very remarkable example of acute hæmorrhagic choroido-retinitis in a young girl. It was a peculiar case, and was supposed to be due to amenorrhœa, thus confirming the supposition that variations of vascular tone in connection with the sexual system were the usual cause. The next case described was an important one, in which the notes extended over nearly twenty years. The patient, a married man, in whom there was no history of syphilis, had suffered from most extensive choroiditis in both eyes. The progress of the disease had been marked by very distinct recurrences at intervals of a few years, attended by pain and increase of failure of sight. One pupil was almost closed by adhesions, and in both some tendency to cyclo-iritis had been noticed. It was suggested that this case was really of the same nature as the examples of relapsing cyclitis so well known in association with chilblain proclivity, and sometimes with inheritance of gout. A group of three remarkable cases was next referred to, in which young women, apparently in good health, had become the subjects of aggressive choroiditis in both eyes without obvious cause. In all the suggestion of inherited syphilis seemed quite excluded by the family history; but in one in whom periostitis of the tibia was present, it was possible that syphilis had been conveyed in vaccination. Mr. Hutchinson said that, so far as the objective phenomena were concerned, he knew of no means of distinguishing these cases from the common syphilitic type. The absence of history and of concomitant symptoms were the only diagnostic guides. All were of the serpiginous form (lupus of choroid), and in two, although the patients looked strong, strumous disease of lymphatic glands had occurred. With the cases last mentioned were given three others, of which men were the subjects, and in which the disease began later in life, the peculiarity again being the entire absence of probability as to syphilis. As in the preceding, the common conditions of syphilis were exactly simulated. In concluding his paper, Mr. Hutchinson said that he sought diligently, but quite without success, for any guiding symptoms

by which to distinguish the cases of choroiditis which were not syphilitic from those which were so. He had presented, in illustration of what he said, a great number of very good drawings, and he was quite sure that if he were to place them all side by side on the table, no one would be able by reference to the appearances presented to pick out the non-syphilitic ones. Under these circumstances it still remained to some extent an open question whether, even in the exceptional cases in which the evidence against syphilis seemed the strongest, we ought yet to suspect its presence. There were obscure ways in which specific contamination was sometimes effected without the patient's knowledge; and, as regards inheritance, it must be admitted that it was not always possible to find its proof. All must be familiar with cases in which for long the diagnosis of syphilis had been abandoned, until unexpectedly some chance collateral fact came to light and revealed it. He also adverted to the extreme difficulty of recognizing signs of activity in the processes of choroiditis, and of distinguishing cases which were still aggressive from those which had come to an end. He related some very remarkable instances of improvement from treatment by mercury and iodides, under conditions which had at first been thought hopeless. Almost the only symptom which he knew of as implying aggressiveness was the existence of a narrow line of yellowish white around the patches, and it was by no means always present. His facts justified him, he said, in urging that whatever the stage and whatever the diagnosis, whether syphilitic or otherwise, mercury ought to have a prolonged trial in all cases of choroiditis. It was very remarkable what excellent sight might be regained, in spite of the most extensive destruction of the membrane. The President had met with cases of choroiditis in which no evidence of syphilis was obtainable, but which, so far as the ophthalmoscope picture was concerned, could not be distinguished from those of syphilitic origin. He agreed with Mr. Hutchinson as to the value of mercury and iodide of potassium, even in a very late stage of choroiditis. Dr. Mules was able to add to Mr. Hutchinson's list one more case of hæmorrhagic

chloroiditis. The patient was a young lady, aged 19, under the care of his father. Choroidal hæmorrhage occurred at intervals of four to six weeks during which time menstruation was suppressed. About three or four months after the fourth recurrence of the hæmorrhage she died of apoplexy. Dr. Argyll-Robertson had seen numerous cases of choroiditis in which there was no specific taint. He thought that the area of the fundus chiefly affected might aid in diagnosis, the syphilitic variety affecting chiefly and by preference the periphery, whereas in the other varieties the stress of the disease fell upon the central part. In the syphilitic form also both eyes were gradually affected nearly equally, and the patches were more or less symmetrically arranged in the two eyes; this was not so generally the case in the non-specific varieties. Mr. Warren Tay asked whether some exceptional cases of myopic choroiditis might not closely simulate the syphilitic form, and referred to one case, a lady, in whom no evidences of syphilis could be obtained, but whose choroids exhibited changes extremely like those caused by syphilis; her refraction was myopic. Mr. Hutchinson, in reply, said he well remembered the case referred to by Mr. Tay, and fully agreed with him that myopia might induce changes very like those of syphilis. That fallacy was, however excluded in the cases which he had cited by the fact that no myopia was present in any one of them. He could not agree with Dr. Argyll-Robertson that syphilitic choroiditis might be distinguished by its being usually peripheral. That due to inherited taint was often so, but that from acquired disease was often—indeed, usually—central. Although he had adduced evidence in support of the belief, he must confess that he did not feel quite so certain as Dr. Argyll-Robertson and the President appeared to be that there were cases which resembled syphilis and yet were not of that nature. He thought that all such exceptional cases should be carefully recorded and the facts sifted, not only with the hope of deciding the syphilitic question, but of discovering other antecedents which might possibly be the causes of the disease.

Primary Retinal Phlebitis.—Dr. Mules (Manchester) exhibited ophthalmoscopic drawings and read notes of three cases of primary retinal phlebitis. In two of these, clots in the veins were clearly seen with the ophthalmoscope. In the first and second cases the retinal changes cleared, leaving the patients without ophthalmoscopic evidence of any visual disability; the fields of vision showed only well-marked central scotomata. The third case, occurring in a man aged 80, was of exceptional interest, for in addition to the phlebitis there was an exudative choroiditis of a gouty character, the first instance in which such a condition had been substantiated. The author expressed a hope that more of these cases would be recorded, and a careful study made of the disease of the intra-ocular, concerning which our knowledge was as yet very scanty. Mr. Hutchinson was greatly interested in Dr. Mule's account of his cases. Some years ago he had had several cases under his own care in which he thought retinal venous thrombosis had occurred, and in one of these the thrombus had shifted its position in the vein during the time the patient was under care.—*British Medical Journal.*

BOOKS.

We are in receipt of a new series of publications by that most enterprising firm, W. Wood & Co., of New York. The series is entitled: *Wood's Medical and Surgical Monographs.*

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THE USES OF AN ARTIFICIAL EYE-SHELL FOR OPERATIVE AND OTHER PURPOSES.

BY THOMAS R. POOLEY, M. D.,

Surgeon in Chief to the New Amsterdam Eye and Ear Hospital.

I. *Symblepharon.*—"Numerous are the expedients which have been resorted to for the cure of this affection, but they all have for their object the mechanical separation of the lid and eye-ball until the surfaces cicatrise. Some surgeons endeavor to effect this by simply disecting the adherent lid away from the eye-ball, and then tearing the wound daily for a certain period, until it no longer unites; others, again, try to keep the surfaces separate by interposing foreign bodies, such as sealing-wax, glass shields, or similar substances. It is always found, however, that nature frustrates any attempt to remedy the deformity by such expedients, for they are based upon the supposition that a delicate physiological action can be replaced by a mechanical contrivance, whereas whenever such surfaces rest upon each other they ultimately adhere together."

The above quotation is taken from Wolfe, Diseases and Injuries of the Eye, and it must be admitted is only the reflection of an opinion which is almost universal as to the futility of keeping separate the adherent surfaces after dividing a symblepharon by any mechanical contrivance.

Nevertheless the success which this writer has obtained by just such a procedure seems to warrant the report of the following case :

Miss K., æt. 46, came to the New Amsterdam Eye and Ear Hospital on Dec. 28, 1888. In both eyes were the upper lids adherent to the globe.

In the left where the adherence of the lid was almost throughout its entire extent the cornea was leucomatous, and there was no possibility of restoring any vision.

In the right, however, in which the middle third of the lid was adherent to the eye-ball, the cornea although pannous, was sufficiently clear to permit of vision sufficient for the patient to see her way about.

Besides the adherence of the lid there was also entropion, so that the lashes swept the cornea. The whole condition was probably due to a neglected or badly treated trachoma. Instead of resorting to an operation for transplantation of the symblepharon as recommended by Teal, Wolfe and others, I determined to try keeping the opposing surfaces separated by use of an artificial glass shield, which had lately been brought to my notice, shaped exactly like an artificial eye, but of transparent glass, carefully smoothed and polished, so as not to irirate the eye over which it is inserted.

These shells were brought to my notice by M. Brière, formerly an associate of Boissonneau, of Paris, who told me that they could be worn over a perfectly healthy cornea, as had been proved by himself.

The method of operating was as follows: The symblepharon, which was found to consist of two bands, was freely dissected from the eye-ball, so that the lid was easily lifted from the globe, the cul de sac being fully sutured. Knapp's entropion clamp was then introduced and Snellens' operation for entropion made.

The glass-shell, shaped exactly like an artificial eye, was then introduced, care being observed to use one sufficiently large, so that the low surfaces were kept apart. Care was taken to have it thoroughly clean, by keeping it for some time in a solution of bichloride of mercury, 1-5000.

The glass eye which fitted exactly like an artificial eye was then introduced and tolerated by the patient with but little in-

convenience and no pain. It was allowed to remain for 24 hours before its removal and caused so little discomfort that it did not interfere with the patient's sleeping, and she could see through the glass to find her way about. The shell was allowed to remain for a week, only removing it 3 times a day for the purpose of cleansing the eye and the artificial shell. At the expiration of this time the surface on the lid was so nearly cicatrised that it was only found necessary to wear the shell every alternate hour and at last only during the day, it being left out at night. The patient remained in the hospital for four weeks and was then discharged—both surfaces having entirely cicatrised. The lid was entirely free from the globe with the exception of a single very narrow band of adhesion which could, however, only be seen when the lid was forcibly raised so as to expose the bottom of the cul-de-sac, and which was no doubt caused by the fact that the glass-shell was hardly large enough to prevent the contact of the surfaces at this place. The depth of cul-de-sac, however, obtained was quite as good as that usually resulting from the different methods of transplantation, and the movements of the eye were not restrained in any direction. Her sight which had been only equal to quantative perception of light was $^{20}/_{cc}$.

Whether this method will succeed in every instance or not must be decided by further experience. There can be no doubt that the foreign body, the glass-shell, was the better born in this case on account of the condition of the cornea, for, as is well known, all sorts of operative procedures are well borne in cases of pannus of the cornea.

II. I would suggest that this shell which can be readily tolerated over the natural healthy cornea, may prove of use in preventing the infection of the healthy eye in cases of blennorrhœa, and at the same time prove more comfortable to the patient than the methods now in use of excluding the healthy eye by permitting the patient the use of vision.

These shells are manufactured by M. Brière of No. 838 2nd Av., New York.

RUPTURE OF THE CHOROID.

BY DAVID COGGIN, M. D., SALEM, MASS.

Rupture of the choroid being of infrequent occurrence the brief history of two cases of this accident may not be without interest.

1. 1st December, 1884.—Fred. A., æt. 20, was seen in consultation. Three days before, while playing polo in a rink, he was knocked down by a polo-stick, cutting the skin of his left eye-lid and also that near the outer canthus so that sutures were called for.

He was in bed, as he had suffered from nausea and was still feeling badly. Eye not tender. Some ecchymosis of lids. Pupil widely dilated and nearly hidden by a thin layer of blood which extended to the nasal periphery of the anterior chamber and whence it was then thought the hæmorrhage had come. Tn. V.=Fingers at 15 centimetres. On the following day, at my office, he saw fingers at 1 m. ($^{4}/_{\mathrm{IV}}$ *o. d.*) Unable to converge, *o. s.* and slight ptosis. Blood absorbed from the anterior chamber but no view of fundus.

9th Dec. Through hazy media, made out what seemed like separation of the retina in the region of the macula.

16th. Now can converge eye. Pupil continues dilated. Central scotoma. What was taken for retinal detachment now proved to be an extensive rupture of the choroid—the sclera being visible—on the temporal side of the disc and resembling an inverted Y.

7th April, 1885. V. unchanged. The place of rupture filled with gray-black pigment, the two prolongations below appearing as delicate cicatricial lines. The patient was not seen again as he fell a victim to pneumonia the succeeding year.

2. James, a Salem boy æt. 11 years, was hit in his right eye by a stone thrown by a street Arab just as he was brought to me, the 10th of October, 1883. There was a large but superficial central abrasion of the cornea and a bit of stone was impinged in its lower border which was at once removed.

V. quantitative. Pupil dilated. Ordered atropine salve, a band and the like. The next day $V = {}^4/_{LX}$. 22d Oct. $V = {}^4/_{XXXVI}$. Sees a 'notch' when he looks at any object. Media still too cloudy to allow a view of the fundus. Some pain and ciliary redness.

A month later, a semilunar rupture of the choroid was seen on the temporal side of the disc, extending above and below it and distant about the diameter of the disc from the disc-border.

A dark round deposit, like the remains of a clot, in its centre. 3rd Dec. V. ${}^4/_{XXIV}$. Rent contracting over exposed sclera. Patient says he over-reaches when handling his toys. Occasional pain goes from head to eye. Pupil yet slightly dilated. 11th Feb., 1884. $V. = {}^4/_{XVIII}$. 'Notch' less trying. Site of tear in choroid now recognized only by its light color. Some letters of Sn. 1 made out. When next examined, in May, 1887, no view of the fundus was obtained owing to the increase of the zonular cataract, which had first been seen in its incipient stage, five years earlier.

Zonular Cataract.

J. O., æt. 10, a promising boy, belonging to a well-known Massachusetts family, was brought to me in September, 1882, because it was thought he could not see well with his right eye.

V.—${}^4/_{VI}$ *o. u.* xl. $D. = {}^4/_{IV}$ *o. s.* No glass helped o. d. xl.(+1.5) $S = {}^{50}/_{L}$ *o. u.* H. by mirror. Fundus hazy owing to slight, disc-like opacities in both lenses and suggestive of zonular cataract. The retinal vessels, etc., could be fairly seen though less distinctly than through the periphery of the lenses.

An aunt had a 'cataract' and became blind at twelve.

His sister has irregular as., and his grandfather had 'peculiar sight.' In the ensuing July, atropine was used and V.=$^4/_{XXIV}$ *o.s.* $^4/_{IX}$ *o.d.*—no glass helping. Opacity in lenses increasing. In October, as stated before, he suffered a rupture of the choroid (o. d.) 4th Jan., 1884, V.=$^4/_{VI}$ *o. s.* $^4/_{XXIV}$ *o. d.* 22d May, 1887, V.=$^4/_{XII}$ *o. s.* and $^{15}/_{L}$.

$^4/_{LX}$ *o. d.* and reads Sn. l. Cataracts more dense—periphery still transparent. In such a case, where the trouble has steadily increased, it certainly seems as if any thing short of the removal of the lenses would be of only temporary benefit.

The following case is hardly analogous but it may be worth relating. 22d January, 1887. Wm Fitzgibbons, æt. 39, N. B.—He sought advice at the Salem Hospital, because of life-long 'near-sightedness' V.=$^4/_{XXIV}$ *o.u.* After atropine it was $^4/_{XVIII}$ *o.d.* only. Unable to read fine type. By the ophthalmoscope, typical zonular cataract *o. u.* Glasses of no help. 29th Jan.—Ether. Iridectomy, in and down, both eyes. 4th Feb. V.= $^4/_{XII}$ *o. u.* and Sn. l. readily. ('Never seen so well before.')

A NEW OPTOMETER.

BY ELMER STARR., M.D.

Lecturer on Ophthalmology, Medical Department, University of Buffalo.

This optometer is constructed of two tubes 8 cm. long, one of which telescopes within the other. Each tube is fitted with a lens at one end, the outer tube carrying a —16.D., the inner one a +16.D., so that when the tubes are closed the plus glass exactly neutralizes the effect of the minus glass and the combination equals 0. In using this optometer the eye to be tested looks through the instrument from the opposite end to the one carrying the lenses, and examines the test type ordinarily used in testing vision, placed twenty feet away. It will be observed that by this arrangement the eye is kept at a distance of 8 cm.—the length of the tube—from the plus lens of the instrument; by this means the size of the letters and their apparent distance remain unaltered and appear the same as when a single lens which the combination represents is used. When the instrument is closed the effect is the same as a plain glass, and the combination stands at 0, so that the test types appear the same as when examined without a glass. When the tubes are extended the result is a plus combination, whose power gradually increases as the tubes are extended, passing from 0 up to +16.D. when the tubes are fully extended and the lenses most widely separated. So that by examining the test types through this instrument an error in refraction in the eye requiring a plus glass for its correction can readily be determined.

For the minus combination the cell holding a —16.D. lens is slipped off into the proximal end of the inner tube. Now

when the instrument is extended this —16.D. just neutralizes the effect of the other two lenses, and the result is again a plain glass or 0. Then as the instrument is closed the result equals a minus glass whose power gradually increases up to —16.D. when the tubes are closed.

The tubes are worked with rack and pinion, and are marked with a scale, so that the result can be read off immediately after the correction has been found. The circumference of the tube is also marked, at its end, with the degrees of a circle, for use when correcting astigmatism. When used for this work a disk having a stenopaic slit is fitted to the end of the instrument so that the slit can be inclined at any angle.

The optical principles of this instrument are these: The —16.D. lens with which the outer tube is fitted forms a virtual image of the test types examined, about 6.25 cm. in front of the instrument; that is, just at the focus of the +16.D. lens of the inner tube, when the tubes are closed and the lenses in contact. So that rays of light from the test types, after passing through this refracting system, leave the plus glasses parallel, or just as if they had come from the type without passing through any refracting system. When the glasses are separated by extending the tubes the strength of the refracting plus combination may be determined by the following equation:[1]

$$\frac{p-f}{f} = \frac{f}{p'-f}$$

Suypose the tubes are extended until the glasses are separated by 1 cm. Then the plus glass will be 6.25+1=7.25 cm. from the virtual image. Replacing the letters with figures in the equation we have:

$$\frac{7.25-6.25}{6.25} = \frac{6.25}{p'-6.25} \quad p'=45.31.$$

That is, the effect of separating the lenses of the instrument

[1] f denotes the focal length of the plus lens, p the distance of the image (object) from the plus lens, and p′ the focal length of the resulting combination.

1 cm. equals a plus glass of 45.31 cm. focus, or about +2.20 D. But in using a plus glass to examine test types twenty feet away, or at any distance twice the focal length of the glass used, the effect or power of the glass increases with its distance from the eye. Now the glass in the tube of the optometer is 6.25 cm. in front of the eye looking through the instrument. Therefore, although the effect of separating the glasses 1 cm. equals a lens whose focus falls 45.31 cm. behind it. Yet this lens is situated 6.25 cm. in front of the eye, which brings its focus 6.25 cm. nearer the eye. That is, it has the same effect upon the eyes as a lens of $45.31-6.25=39.06$ cm. focus $=2.56$ D. Hence, extending the tubes of the optometer 1 cm. gives a +2.56 D. In the same way it can be shown that the effect of extending the instrument fully, *i. e.*, 6.25 cm., equals +16 D. From this it is readily seen how any minus combination may be obtained by placing a —16 D. in the end of the tube, as already explained.

Similar calculations will give the effect when examining test letters for the near point. In this case, a different distance being used, a different result is obtained; so that the tubes are marked with a second scale for use when testing vision for near work.

ADVANCEMENT, WITH BUT A SINGLE SUTURE.

CHAS. H. BEARD, M.D., CHICAGO,

Oculist and Aurist at the North Star Dispensary, Assistant Surgeon to the Illinois Charitable Eye and Ear Infirmary.

I have for the past two years, with most gratifying results, practiced in all my cases of advancement a method which may be briefly described as follows :

The lids being held apart in the usual way, a long horizontal incision is made through the conjunctiva over the tendon of the muscle to be advanced, and carried quite up to the cornea. The conjunctiva is dissected up well around about the insertion of the muscle, care being taken not to disturb it in the immediate vicinity of the cornea. The tendon is caught up on an ordinary strabismus hook, which is slid back and forth a time or two, to free the muscle and tendon from any attachments to surrounding parts, then given to an assistant to hold. Next a double-armed thread (No. 3, black) is taken —two delicate needles, curved on the flat from the point back half way to the eye on either end of the thread. One needle is passed downward through the tendon near its upper edge (or, even through the belly of the muscle, if the squint be excessive), and the other also, downward, though near the lower edge, thus throwing a stitch across the central portion of the tendon (or muscle) on its outer aspect. (See Fig. 1). An important item being always to keep the upper and the lowar needle quite distinct and separate for obvious reasons. The next step is to cut the muscle at the distance of about two millimeters from the stitch—on the corneal side, of course—and to give the thread in charge of an assistant. (Though I have

done the operation alone.) Now, pick up the stump of the tendon and cut it off close to the sclerotic, which procedure adds greatly in the way of an elegant result. After this, the upper needle is to be introduced beneath the conjunctiva, stitching it along through the episcleral tissue, and bringing it out near the cornea at a point opposite to its vertical diameter, and the same with the other needle below the cornea. Then the upper needle (or the lower, it is immaterial) is carried back and the point passed under the loop of thread lying

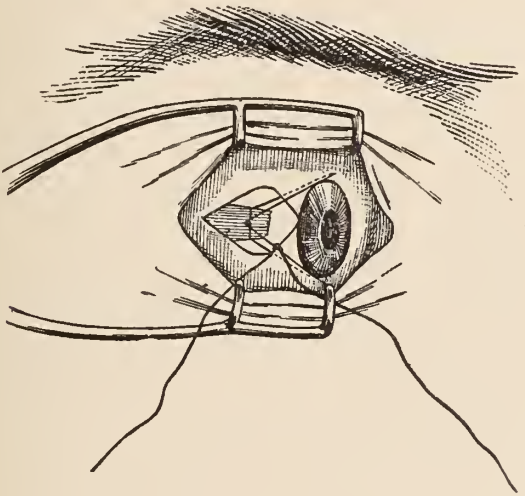

FIG. 1.

across the muscle, introducing it from behind, even allowing it to pick up a slight hold on the muscle on its way. After drawing the thread well through, both needles may be removed and the suture knotted. This stage does not differ essentially from other forms of advancement operations.

As in other operations, one must regulate the degree of tension applied in trying the thread, by the amount of effect desired; and it is most essential, particularly where no tenotomy, or only a partial one, of the counteracting muscle has

been made to have the globe rotated in the direction of the muscle to be brought forward, otherwise the suture is liable to cut or tear.

I greatly prefer not to have the patient anæsthetized, and it is really remarkable, that a large majority of the patients suffer absolutely no pain when submitting to this operation under cocaine alone.

I do not claim for this method like the man did for his Indian medicine, that one of the chief recommendations is its never failing efficacy, but I do think it has its advantages, the greatest of which is the inevitable advancement of the muscle in the direct line of its axis, as well as of its natural action. In this it would seem to be more exact than any other pulley operation ever brought to my notice; the very nature of the suture's arrangement precluding the possibility of fixing the muscle awry, and there is nothing to prevent the cut end of the muscle from coming forward, if necessary, quite to the margin of the cornea.

The operation is, moreover, very simple, and when the time arrives for the removal of the suture but a single snip of the scissors is required, when the thread may be easily withdrawn with forceps. I never close the conjunctival opening by sutures—merely arrange it, as well as possible, over the place with the aid of toilet forceps.

If it is necessary to combine a tenotomy of the opposing muscle with the advancement, I always do the latter first.

ON PTERYGIUM.[1]

BY ADOLF ALT, M.D.

Gentlemen.—The subject I want to draw your attention to may seem a very small one, yet as in the building of a house, every particle counts, and is important, so it is in medicine. I have selected this subject, *pterygium*, first, because it will not take much of your valuable time; and second, because in my connection with the Missouri Pacific Railroad I have come so much more frequently in contact with this affection than ever before. I cannot give the percentage in which the firemen, brakesmen and conductors of a railroad are subject to the growth of a pterygium, but that it is a very prevalent affection among them I need probably not tell you, and almost everyone of you may have to deal with it.

Pterygium is a growth of a more or less triangular shape, with the base in the conjunctiva bulbi, while its apex encroaches more or less upon the cornea. This triangular growth may be found to lie in all the different meridians of the eyeball; it lies generally, however, in the direction of one of the recti muscles, and its seat of predelection is that part of the eyeball which during waking hours lies exposed behind the palpebral fissure, that is, the horizontal meridian; but by far the greater number of pterygia lie on the nasal side of the eyeball, over the internal rectus muscle.

This triangular growth may reach only the edge of the cornea, or it may gradually grow toward the centre of this membrane, and even grow beyond it. In rare cases two such

[1]Read before the National Association of Railway Surgeons, held at St. Louis, May, 1889.

pterygia coming from diametrically opposite directions may meet and unite with each other.

While small pterygia are usually flat and but little elevated over the surrounding conjunctiva and the level of the cornea, larger ones may represent a thick, vascular, fleshy growth which rises over conjunctiva and cornea, the edges of which lap over the neighboring conjunctiva so that a probe can be entered for quite a distance beneath them. In internal pterygium the lachrymal caruncle is not unfrequently stretched and pulled toward the cornea, so as to lie upon the bulbar conjunctiva instead of its normal position.

The nature of the pterygium has been studied frequently under the microscope. It consists essentially and purely of conjunctival tissue. In order to explain this curious hypertrophy two theories have been advanced in former years. According to the one, ptergium is a polypoid growth of the conjunctiva, which being pressed on the cornea by the lids becomes agglutinated to this membrane. Arlt of Vienna, who originated the second theory, thought that a marginal ulcer of the cornea becomes covered by an overlapping fold of the adjacent swollen conjunctiva, and that the growth of the pterygium is due to a continued ulceration of the cornea at the apex of this conjunctival growth.

Neither of these theories fully explains the conditions. If every marginal ulcer of the cornea was able to produce a pterygium, pterygia would be much more common than they are. There must be something more than a common marginal ulcer.

Some 12 years ago I had, as the first, the opportunity to examine a whole eyeball with a pterygium histologically, and my publication was soon followed by one by Goldzieher of Buda-Pesth. These two cases seem to be the only ones so examined to this day. As new they brought to our knowledge, that epithelium is found under the pterygium and lying upon the sclerotical and corneo-scleral tissue. This proves as certain that a fold of conjunctiva must have been glued to the underlying tissue. This epithelium undergoes slow retrogres-

sive metamorphoses, and I have twice had occasion to see a large cyst formed under a pterygium containing colloid fluid. probably due to the metamorphosis of this incarcerated epithelium. Such observations prove beyond a doubt that a fold of conjunctiva is glued to the cornea. The fact that the lachrymal caruncle is found lying upon the bulbar conjunctiva shows, that during the further growth of the tumor a very considerable traction must again and again be exerted upon the conjunctiva at the base of the original fold. Where this force and the continued stimulus come from is still an open question.

In a recent number of THE AMERICAN JOURNAL OF OPHTHALMOLOGY Dr. Theobald, of Baltimore published an article of the pathogenesis of pterygium in which he claimed that on account of the intimate connection between the vascular system of the recti muscles and that of the conjunctiva in the neighborhood of the corneal border these muscles, by influencing the blood supply of the overlying conjunctiva do, in fact, play a most important role in determining the formation of a pterygium. Further on he comes to the conclusion, that the internal recti muscles would exert this influence by far more decidedly than any of the other recti, and that thus we have a satisfactory explanation of the fact that pterygium occurs in so large a majority of the cases to the nasal side of the cornea.

This theory sounds quite plausible. Yet, if true for the internal ptergia, how would Theobald have us understand the formation of pterygia in the direction of other recti, or those lying in other meridians? Moreover, if this theory for the explanation of how internal pterygium may be formed were correct, why should it be most common among those classes of people whose internal recti muscles are perhaps least strained? Should we not expect internal ptergia in the majority of eyes that are daily and continually used for near-work? Yet just in these classes they are almost totally wanting.

A much better, and perhaps the true explanation, at least for the prevalence of internal pterygia, was given by Dr. Young

of Burlington, Iowa (see this journal, volume IV, No. 10, page 302). He says: To shut an eye to irritants and yet keep it open sufficiently to see any work ahead the orbicularis necessarily contracts irregularly. Extremely to the temporal side, moderately through the rest of its course. ' The result is that in the great majority of people the eye is well protected except over the centre of the cornea, and a small strip to the nasal side of the cornea.

This explanation is, I think, a very good one as far as it goes, that is, as long as we have to deal with internal pterygia only—but it will in no way apply to pterygia corresponding to the vertical meridian and others.

The easiest way out of this difficulty is the assumption of a microbe which falls into, or even causes, a small ulceration of the cornea, which then is covered by a small fold of conjunctiva. As the microbe grows into the cornea, and nature tries to heal the ulcer, the conjunctiva is dragged along. This theory, or a similar one, was propounded by Poncet, without histological proof, as far as I know. In the specimen of a whole eye I had occasion to examine, the apex of the pterygium entered the corneal tissue like a wedge, and the corneal lamellæ nearest to it were filled with small granules, for which I then had no explanation. Perhaps they were such microbes. I think, therefore, that Arlt's theory, combined with Poncet's, explains the formation of pterygia still best; that is, that for the formation of a pterygium we must first have a loss of substance in the corneal margin; second, a microbe which grows slowly into the corneal tissue; and third, a small fold of conjunctiva, dragged on the cornea by the continued progress of microscopical death and attempted repair in the corneal tissue.

Such premises are easiest brought into existence in the lifework of men who are continually exposed to wind and weather, to heat and the flying of small foreign bodies; and the classes to whom this would apply are just the ones most frequently attacked by pterygia, namely: farmers, seamen, blacksmiths, firemen, stokers, glassblowers, and last but not least, railroad employees.

If it was possible to prevent the formation of pterygia, a great boon would be conferred upon these people. Two things might suggest themselves to serve this end. First, protective spectacles. They would, however, be of little use, unless they fit closely to the face, which is disadvantageous in other directions. Spectacles which do not fit closely act, in my opinion, rather like a chimney by means of which foreign bodies are drawn into the eye. Protective spectacles, therefore, will not do to prevent pterygium, even if it should be possible to get these people to wear them.

The other preventative might be the use of an antiseptic wash, night and morning. I am satisfied, that this means has in my experience already done some good, and is capable of doing a great deal more, I think, if practiced more generally.

But, how shall we deal with a pterygium when the patient presents himself? The only lasting remedy is the removal of the growth. The number of ways in which this is done is large, and I shall not try to bore you by reviewing them all. The most well known and most frequently practised operations are the following:

1. The simple excision. This operation which is probably the oldest one, consists of a careful dissection of the apex of the pterygium from the cornea, and the excision of a rhomboid piece of conjunctiva. The wound over the sclerotic may or may not be closed by stitching the conjunctiva. This operation prevented a relapse, as a rule, in small pterygia only. For larger ones it was seldom successful.

2. Transplantation of the pterygium into the retrotarsal fold. This operation was introduced by Desmarres, who, after dissecting the pterygium, made a cut in the retro-tarsal fold of the conjunctiva, going up or downward from the base of the pterygium. The whole growth was then stitched into the resulting gap, after the manner of a twisted flap. Knapp, not satisfied with the resulting asymetrical swelling thus produced in the lower or upper cul-de-sac, improved this method by cutting the pterygium after the dissection in halves, and by trans-

planting one-half downward and the other upward. The results of these operations were good, as a rule.

3. An operation whose author I do not know. Its first step is the dissection of the pterygium. Then the conjunctiva is undermined at the base of the growth and a thread armed with two needles being passed through the apex of the ptergium, the latter is turned under the undermined conjunctiva, rolled up, as it were, and there fastened by the sutures. An ugly looking swelling at first results from this procedure, which, however, gradeally disappears as the ptergium atrophies. The final results are mostly good.

4. Prince of Jacksonville once accidentally tore a pterygium off from the cornea, and the result, according to his description, was so excellent that he seems to have since adopted this method of evulsion for all pterygia. I have never tried it, and never shall for obvious reasons.

All of these methods aim at a successful removal of the growth with the prevention of a relapse, and at rendering the part of the cornea on which the growth had been lying as transparent as possible.

Starting from the idea that microbes play an important role in the formation and growth of a pterygium, I have for several years removed all pterygia in the manner which I shall now detail.

After having carefully disinfected the conjunctival sac, the eyelashes, lids and eyebrows by means of a sublimate solution of one in 2,500, and having the eye well concainized, I grasp the pterygium with toothed forceps, and gently pulling it away from the eyeball, dissect it off from the cornea as neatly as I possibly can. I prefer for this part of the operation a bent lance-shaped knife. Then I make the rhomboid excision, detailed before, with scissors. Next the bulbar conjunctiva is well undermined up and downward and brought together by one or two sutures. Then the uncovered portion of the sclero-corneal tissue and the loss of substance on the cornea are *cauterized with pure carbolic acid.* This procedure is followed by the instillation of a solution of sublimate of one in

from 3,000 to 5,000 every two hours for some days, then less frequently. I have done this during the last year on sixteen railroad men alone. The results were all that could be wished for, that is, not only has no relapse occurred in these cases, but the cornea has cleared up nicely, and, in some severe cases, wonderfully.

I instruct the patients after I have removed the sutures, which I do on the fourth or fifth day, to continue using a sublimate solution of one in 5,000, nights and mornings, and I can recommend this method. It simplifies the operation and gives better results than the newer methods of transplantation. The method is simply the old careful excision with antiseptic measures before and after the removal added to it.

TRANSLATION.

EXPERIMENTAL RESEARCHES CONCERNING THE ANTISEPTIC AND GERMICIDAL ACTION OF CREOLIN.

BY E. VAN ERMENGEM.

(*Bulletin de l' Academie royale de médicine de Belgique.*)

This excellent critical and exhaustive article ends with the following conclusions drawn from a number of series of experiments.

"The sample of creolin which was furnished me by the firm of Pearson & Co., of Hamburg, has proved itself to be an antiseptic of the first class, decidedly superior to phenic acid, and comparable only to the bichloride of mercury.

Although it may happen in practice that this action is retarded or even considerably reduced by the presence of serous and albuminous substances, the 5 per cent solutions of creolin still merit the preference of the surgeon, on account of their less irritating action, than that of the acidulated solutions of the bichloride of mercury or of phenic acid, and on account of the absence of any poisonous effect.

Its faculty to kill the spores does not surpass that of phenic acid when tartaric acid is added, yet it almost equals it.

The usefulness of 5 per cent solutions of creolin for disinfecting purposes is due to their very energetic germicidal action with regard to many of the most important pathogenic microbes: namely spirillæ, cholera bacilli, typhoid fever bacilli, strep-

tococcus of erysipelas (puerperal fever), staphylococcus pyogenes. If their innocuousness in man should become confirmed, we could not refuse to give these solutions the first position among all the disinfecting fluids, because their application could fearlessly be left to the nurses and to the even most ignorant public, especially in times of epidemics and for the antisepsis during confinement.

In fact, it seems that creolin combines all the qualities which the hygienist must ask from a disinfectant which should be useful in general practice. It acts as a germicide, and its action upon infecting substances, whatever their origin, or under whatever form they present themselves, is most certain. Its action is rapid and it can be used profusely without fear of poisoning, and without spoiling the object (linen, bedding, etc.,) which are submitted to its action.

It is, furthermore, an excellent desodorant, a quality which is by no means without its value. Finally the price is low, and it can in consequence be used largely for hygienic purposes of the most varying character.

All experiments should be heartily encouraged which are made for the purpose of giving the precise knowledge of its composition, of assuring its invariability, of rendering it still more active, and of eliminating the inert substances which it now contains.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, MARCH 14, 1889.

J. W. HULKE, F.R.C.S., F.R.S., President, in the Chair.

Color Blindness and Color Perception.—Dr. Edridge-Green read a paper in which, after mentioning in detail the objections, which seemed to him of greatest importance, to the Young-Helmholtz and the Hering theories of color vision, he explained at length his own views and the theory which he had built up as a result of numerous experimental examinations of persons with normal and defective color perception. He held that the color perception centre of every individual was able to appreciate a certain number of units of color, these units corresponding more or less closely to the bands of the solar spectrum. The average number of units was six, namely, red, orange, yellow, green, blue and violet; but persons of unusually good color perception possessed a seventh, namely, indigo or dark blue, which was placed between the blue and the violet. In people with color perception below the average, one or more units of color would be wanting; orange was the first to disappear, and it was replaced by a widening of the red and yellow bands. Such an individual would belong to the five-unit class. Blue was the next band to disappear, the violet then extending to the normal blue-green junction. The next band to fail was the yellow, the red then reaching to the green. The green and red then became as one band, and so the units were reduced to two, the violet still remaining; in total color-blindness these two were replaced by a neutral band. Dr. Edridge-Green gave the following "laws of color perception," which he deduced from the facts obtained in his investigations: 1. An

individual can have no conception of a color which does not form one of his psycho-physical color units, or a very apparent modification of one of them. 2. If the colors belonging to two adjacent units be mixed, an impression of both units is obtained which is plainly perceived as a mixture. 3. If two colors, not adjacent, be mixed, the intermediate color will tend to be brought before the mind, or white will be the result in the case of pure light, gray where there is partial absorption. 4. If any number of colors be mixed, the resulting impression will be that of a unit, a modified unit, or white. Dr. Edridge-Green exhibited and described a series of tests for color-blindness, which had been made for him, consisting of colored wools, silks, ribbons and cardboard.

Arterial Aneurysm Pressing on the Optic Commissure, Causing Distension of Optic Sheaths, Œdema of Retinæ, etc.—Mr. Jonathan Hutchinson, jr., read notes of the case of a man aged 29, affected with ulcerative endocarditis, who died in the London Hospital, under the care of Dr. Sutton. About twelve days before death he complained of rather sudden loss of sight in both eyes, vision being reduced to counting fingers. Upon examination, the retinal arteries were found extremely small, the veins much diminished, the retinæ white and hazy, and containing scattered hæmorrhages; these appearances remained unchanged till death. *Post mortem*, a small aneurysm was found, lifting up and pressing on the chiasma. It seemed to arise from the end of the basilar artery, and dipped into the pituitary fossa. Both optic nerve sheaths were greatly distended behind the globes, and the lymph spaces in the nerves and immediately beneath the pial sheath were much dilated. There was, in addition, slight retrobulbar neuritis; the central vessels were small but normal. Mr. Hutchinson considered that the case was of interest in connection with the view held by Deutschman and others, as to increased intracranial pressure and simple distension of the optic nerve sheaths not causing optic neuritis, but anæmia and œdema of the retinæ, with hæmorrhages. It seemed to agree with this theory, there being no intraocular neuritis, but only slight infiltration, with

leucocytes in the nerves behind the globes. During life it had been suggested that symetrical embolism of the retinal arteries was the cause of the amaurosis.

Dr. James Anderson was unable to agree with the conclusions of the writer, and did not think the case threw much light on the causes of optic neuritis. The aneurysm must have existed for some length of time, whereas the loss of sight came on suddenly, and shortly before death. Aneurysms of the cerebral arteries in association with rheumatism were not rare, but not necessarily accompanied by ocular symptoms. He thought the amaurosis in this case was probably a part of a general blood-infection such as occurred in cases of septic endocarditis.

Mr. Hartley mentioned a case in which double proptosis and uniocular optic neuritis had come on from three to six months after fracture of the base of the skull. The inflamed optic nerve passed into atrophy, and the proptosis slowly subsided. He had diagnosed an intracranial aneurysm pressing on the optic nerve.

Mr. Doyne looked upon the case Mr. Hartley had mentioned as one of retrobulbar neuritis, with consecutive changes in the discs. He did not think Mr. Hutchinson's case supported Deutschman's views, but was of opinion that the aneurysm had set up a localized meningitis, and that inflammation had extended from this down the optic nerves.

Dr. Herbert Habershon asked the cause of the aneurysm, whether due to arterial degeneration or embolism, and spoke of a case in which a cerebral artery became embolised, and an aneurysm formed on the cardiac side of the embolus.

Mr. Hutchinson, in reply, said the cerebral arteries had been carefully examined, and showed no further abnormality. He thought the fact that no abscesses formed, and no further changes occurred in the retinæ, went against the idea of septic infection. The symmetrical failure of sight was in favor of embolism.

Retinal Changes in Chronic Alcoholism.—Messrs. Edmunds and Lawford communicated the results of ophthalmoscopic

and microscopic examination of the retinæ of a man who died from alcoholic paralysis and heart disease. The ophthalmoscopic changes consisted of widespread haze of retinæ, without hæmorrhages or localized exudation. Sections of the retina revealed slight œdema of the nerve-fibre layer in the immediate vicinity of the optic disc, and well-marked œdema spaces in the outer granule layer, in which spaces were round and oval masses of clear homogeneous effusion. Attention was drawn to the rarity of this condition; the only recorded case, so far as the authors were aware, being one brought forward by Dr Sharkey, at the discussion on chronic alcoholism, at the Pathological Society, in December, 1888.

ERASMUS WILSON LECTURE ON THE PATHOLOGY OF GLAUCOMA.

BY PRIESTLEY SMITH, M.R.C.S.,

Ophthalmic Surgeon to the Queen's Hospital, Birmingham.

Delivered at the Royal College of Surgeons of England, March, 1889.

MR. PRESIDENT AND GENTLEMEN.—The healthy human eye presents to the educated touch of the surgeon a certain elastic resistance; its flexible walls are kept in a state of moderate tension by the fluids which traverse the chambers. Any eye which presents a decided variation from this characteristic condition, whether in the direction of hardness or of softness, is, as we know by experience, an unhealthy eye. I propose to speak in these lectures of the disorders which are associated with an increased tension of the eyeball, disorders to which we apply the name glaucoma.

With the advance of knowledge the word glaucoma has changed its meaning. In the early days of our art, it was applied without discrimination to the various diseases in which a gray or greenish blue appearance replaces the normal blackness of the pupil. In later times, when a clear distinction had been made between the opacities which lie in the crystalline lens and those which lie behind it, the name was reserved for some of the deeper seated and more destructive disorders, the nature of which remained unknown. Hardness of the eyeball, as a part of such disorders, received at that time only casual notice. In the year 1830, Mackenzie pointed out the frequent overfulness of the chambers in glaucoma, and made the first attempt to relieve that condition by puncturing the tunics. Twenty-five years later, von Graefe, studying the subject with

the aid of the ophthalmoscope, convinced himself that this overfulness was no mere complication of the disease, but was the essential cause of the leading symptoms, and was led by this conviction to his beneficent discovery of the curative action of iridectomy. Since that time the name glaucoma, losing its original meaning, has been used to indicate a disease characterized by increased tension of the globe. Certain other characteristics (cupping of the disc, contraction of the visual field) are recognized as consequences of the pressure.

Some writers, however, still deny that what we call glaucoma is necessarily connected with increased pressure. They point to certain exceptional cases in which the contracted field and the excavated disc are found in company with normal tension, and on the strength of these exceptions they maintain that glaucoma is the expression of some unknown agent which usually raises the pressure and excavates the disc at the same time, but which occasionally excavates the disc without raising the pressure. This assumption is, I think, unnecessary. The excess of pressure is sometimes slight; it is often intermittent; it may even be absent for long periods of time; it is very probable, therefore, that these cases of glaucoma with normal tension are cases which have been examined only during the intermissions of increased tensions. Permit me to mention a case in illustration.

Sir William Bowman was consulted by a lady in 1865. He noted (and he has kindly placed the notes at my disposal) increased tension and commencing excavation, diagnosed glaucoma, and spoke of iridectomy. No operation was performed. Twenty years later this lady came under my own care with deeply excavated discs, contracted fields and impaired vision. I saw her many times; sometimes the tension was quite normal, sometimes it was increased. Vision was still useful, but failing rather rapidly. After consultation with Sir William Bowman, iridectomy was performed on both eyes with good result.[1] Now this lady must have had for years an unmistak-

[1] Ophth. Rev. 1885, p. 261.

able glaucoma, but at times, and probably very frequently, a normal tension. Yet pressure was there at the beginning and it was there at the end. One cannot doubt that it was an essential factor in the process.

Glaucoma, then, may be broadly defined as *an excess of pressure within the eye plus the causes and the consequences of that excess.* To understand the morbid process in its entirety, we must study first the normal intra-ocular pressure and the processes by which it is maintained; secondly, the causes which lead to an excess of pressure; and, thirdly, the consequences of such excess.

Estimation of the Intra-ocular Pressure.—It will be well, in the first place, to consider the means by which the intra-ocular pressure has been measured or estimated.

Manometer.—In certain of the lower animals the pressure has been accurately determined by means of the manometer, an instrument which brings the intra-ocular fluid into direct communication with a column of mereury or other fluid. The average normal pressure, the variations due to pulse and respiration, and those produced by ligature of arteries and veins, by section and irritation of nerves, and by the action of certain drugs, have all been ascertained. The manometer has also been applied in a few cases to the living human eye, namely, to eyes doomed to excision, the measurement being made immediately before the operation.

Finger Test.—Under ordinary circumstances it is impossible to measure the pressure in the living human eye, and we have to content ourselves with measuring, as an index to it, the resistance of the tunics. We apply the tips of the two forefingers with light alternate pressure to the upper eyelid while the eye is directed downwards, and we record our observations by means of Bowman's symbols (Tn, T+1, T+2, etc.). For daily use no better method than the finger-test has been, or is likely to be, found, and it must be employed constantly by everyone who would deal successfully with diseases of the eye, but it is obviously inexact. We cannot state with precision the resistance which we feel, and we cannot rely upon the constancy of our sense of touch.

Tonometer.—To obviate this uncertainty, many attempts have been made to substitute for the fingers an instrument of precision—a mechanical tension-measurer or tonometer. I will not attempt to describe the various instruments which have been invented for this purpose; not one of them has hitherto found general acceptance. I will ask your attention rather to the principles which underlie and limit every effort of the kind, my object being not to show how every difficulty may be overcome, but to distinguish the possible from the impossible.

Principles of Tonometry.—Our object is to estimate the internal pressure from the behavior of the tunics under external pressure. The instrument, therefore, must press upon the eye, and must measure both the force employed and the impression produced, for it has more than one dimension; it varies in area and in depth. Are we to measure the area, or the depth, or both?

Area of Impression.—When a flat disc is loaded with a certain weight and placed upon a bladder, it flattens the membrane over a certain area; it sinks until it meets with precisely the same pressure from below as from above, then it remains in equilibrium; hence, if I employ a known external pressure, and measure the area of contact, I can calculate the internal pressure; for example, if I load a disc with a weight of 100 grammes, and if I find that the area of contact equals 100 square centimetres, I know that the internal pressure is 1 gramme to 1 square centimetre. If we were to take a second bladder of different size, or of different curvature at the point of contact, or of more extensible membrane, and place it at the same height and in connection with the same reservoir, we should find that the disc, if loaded with the same weight as before, would have the same area of contact as before. We see then that, *assuming that the membrane is perfectly flexible, the area of the impression produced by a known external pressure is a true index to the internal pressure.* It might appear, then, that the problem of ocular tonometry could be solved in this way. More than ten years ago I arrived by experiment at the principle which has just been stated, but concluded that the diffi-

culties of applying it to the eye were insuperable.[1] Quite recently Professor Fick of Würzburg, following the same theoretical considerations, has invented a tonometer which is correct in principle and very simple in construction.[2] A flat disc is pressed against the eye through the medium of a spring, and the force exerted by the spring is indicated by the scale behind it. The area of the disc is known; let us say that it is 50 square centimetres. I now press the disc against the bladder until it depresses and flattens exactly its own area of the membrane, neither more nor less, and I see by the scale that the force employed in doing this is, say, 50 grammes; I know that the internal pressure against the flattened area is equal to the external pressure, that is, 50 grammes, or 1 gramme to 1 square centimetre. Now the value of this instrument obviously depends upon one's ability to depress the membrane precisely to the extent of the disc. A small error in this respect gives a larger error in the estimate of the pressure; thus if the diameter of the depressed membrane be larger or smaller than that of the disc by one-tenth, the area will be at fault by one-fifth, for the areas of circles vary as the squares of their diameters; and the estimate of the internal pressure will be at fault to the same extent. In the actual instrument the diameter of the disc is about 7 millimetres, so that the difficulty of applying it with precision to the eye, covered as the latter is by a more or less compressible conjunctiva, is considerable. Moreover, the readings of the instrument are at the mercy of the operator's wish or prejudice, and it is difficult to apply it with strict impartiality when a little more or a little less pressure will confirm or falsify one's own opinion. The principle of estimating the internal pressure from the area of the impression is unquestionably the right one, and Professor Fick's tonometer is the only one clearly based on this principle. I fear, however, that the difficulty of applying it with precision will be found to cause uncertainty in the results obtained.

[1]Glaucoma, its Causes, etc. London, Churchill, 1879, p. 48.

[2]Inaugural Dissertation by R. A. Fick, Würzburg, 1888, and Transactions of International Ophthalmic Congress, Heidelberg, 1888, p. 289.

Depth of Impression.—The depth is more easily measured than the area. But the sclera of the human eye varies somewhat both as to curvature and extensibility in different individuals, hence *the depth of the impression produced by a known external pressure is not a perfectly true index to the internal pressure.*

And there are other sources of error which cannot be avoided, whichever method we employ.The tunics of the eye are not perfectly flexible; their rigidity varies at different parts and in different inviduals. Again, the thickness of the conjunctiva must be taken into account; a swollen conjunctiva pits deeply, irrespective of the yielding of the sclera. And again, it must be remembered that the tonometer itself raises the intra-ocular pressure for the moment, so that even if it could measure the internal pressure accurately we should learn, not the pre-existing pressure, but the pressure as modified by the application of the instrument; the amount of this modification remains unknown, and it varies in different cases according to the ease with which fluid is extruded from the eye.

No tonometer, then, however ingeniously devised, can accurately measure the intra-ocular pressure, or accurately compare one eye with another. (Here follows the description ot the author's own tonometer).

The manometer, the finger test, and the tonometer in combination, have been useful in determining the pressure which is normally present in the living human eye. If we connect the eye of the dead subject by means of a hollow needle and elastic tube with a column of mercury or other fluid, we can ascertain what pressure is required to induce a degree of tension resembling that of the living eye; we can compare the artificial with the natural tension, either with the finger or more accurately with the tonometer. In like manner we can ascertain what pressures appear to correspond with our own ideas of T+1, T+2, T+3, or with the various degrees upon the scale of the tonometer.

Amount of the Intra-ocular Pressure.—The foregoing are the means by which the intra-ocular pressure has been estimated.

We may next consider the results obtained. Concerning the normal intra-ocular pressure in the eyes of animals, we have a considerable mass of evidence and a very close agreement. The animals chiefly experimented on were rabbits,cats and dogs, and the precautions taken against error were very minute. In nearly all cases the pressure was between 20 and 30 millimetres of Hg; the average was about 25 millimetres. Slight oscillations were found to accompany pulse and respiration, and a more marked rise was produced by contraction of the external muscles of the eye.[1]

Experiments upon the dead human subject with my own tonometer gave a closely corresponding result. I found that in order to produce a tension resembling that of the living eye, a pressure of about 30 centimetres of water—that is, 25 millimetres of Hg— must be employed, and the same result was obtained on testing with the finger. Other observers employing the tonometer in the same way have placed the normal pressure rather higher than this, in one case even as high as 40 millimetres of mercury; but that this latter figure presents a distinctly glaucomatous tension will be manifest to anyone who will take the trouble to employ the finger test in the mortuary in the manner described. Adolph Weber, trusting the finger rather than the tonometer, estimates the pressure, as I have done, at about 25 millimetres of Hg.[2]

This estimate has lately been confirmed by Wahfors, who applied the manometer to several human eyes immediately before excision. One of these was a healthy eye, which had to be sacrificed on account of an oribital tumor. The intra-ocular pressure was equal to 26 millimeteres of mercury.[3]

Again, in the lower animals, numerous experiments with the double manometer have proved that the pressures in the aqueous and vitreous chambers are equal, or so nearly equal that the difference is not discoverable.[4] It has been asserted that

[1]Graefe-Saemisch, Handbook, vol. 2, p. 371.
[2]Glaucoma, its Causes, etc., p. 98.
[3]Trans. of Internat. Ophth. Congress, 1888, p. 268.
[4]Bellarminoff, Abstract in Ophth. Rev., 1887, p. 361.

the vitreous pressure is considerably higher than the aqueous pressure, and some observers have even declared themselves able to detect the difference by placing the fingers on different parts of the globe. This idea, though disproved by accurate observation, is not yet quite abandoned. Experiments of my own upon the freshly excised eyes of animals have shown that the lens is displaced from its normal position by a slight excess of pressure either before or behind it. Thus, an excess in the vitreous chamber equal to 5 millimetres of Hg causes a considerable displacement of the lens and iris, and an excess of 10 millimetres almost abolishes the anterior chamber.[1] Such differences in the two chambers are quite too small to be detected by the finger, and it is obvious that any comparison of the scleral with the corneal tension by means of the tonometer is fallacious. When such differences do occur in the living eye, they produce, and are manifested by, displacements of the lens and iris forward or backward as the case may be.

Concerning the height to which the intra-ocular pressure rises in the human eye under abnormal conditions we have very little evidence. In a case of chronic glaucoma, in which the tension had been slightly reduced by an unsuccessful iridectomy, Wahlfors found with the manometer a pressure of 71 millimetres of mercury. Experiments with my own tonometer seem to indicate that the tension which we call +3 corresponds to a pressure considerably higher than this. Much higher pressures have been produced experimentally in the eyes of animals. In one instance a pressure equal to 200 millimetres of mercury was produced by compression of the aorta and simultaneous irritation of the nerve.[2]

Secretion and Excretion of the Intra-ocular Fluids.—The maintenance of the normal pressure in the chambers of the eye depends upon the due secretion and the due excretion of

[1]Ophth. Rev., 1888, p. 207.

[2]Von Hippel and Gruenhagen. Von Graefe's Archiv., vol. xiv, part 2, p. 219. See also Glaucoma, its Causes, etc, p. 102.

the fluids which traverse them. These physiological processes have been most carefully studied during the past fifteen years, and it will be well to review the evidence upon which our knowledge stands at present. It is only by a careful study of these processes that we can hope to unravel the complex pathology of glaucoma.

The intra-ocular fluids flow, like all other secretions, from the blood-stream. Studying their origin from the anatomical point of view, we find, as possible sources, two vascular membranes, the uveal track and the retina. We may at once eliminate the retina, for clinical observation shows that complete blockage of the retinal vessels by embolism causes no discoverable change in the fulness of the chambers. The uveal tract consists of three distinct parts, namely, the choroid extending forward as far as the ora serrata, the ciliary portion reaching from the ora serrata to the base of the iris, the iris ending at the margin of the pupil. The functions of these several parts may to some extent be inferred from their structure and relations.

The choroid, by its internal surface, nourishes the external layers of the retina. Its capillaries feed the pigmented epithelium, and the epithelial cells keep the rods and cones in a state of functional activity. The meshes of the capillary plexus become progressively less and less close from the posterior pole to the anterior limit, and this arrangement accords with the varying sensibility of the corresponding zones of the retina. There is no evidence that the choroid nourishes the vitreous body, and it is obviously improbable that a highly organized membrane like the retina, which has many differentiated layers and a separate vascular system of its own, should convey nourishment from the choriod to the vitreous.

The iris has a well-defined optical function, that, namely, of regulating the entrance of light. It is possible that its posterior surface, like the rest of the uveal surface, may have a secretory function as well, and take some part in the formation of the aqueous humor, but this part must be quite a subordinate one,for there are many cases on record in which the iris has

been completely absent, either from birth or from injury, and there has been no discoverable insufficiency of the aqueous fluid; the tension has been normal.

The ciliary portion of the uveal tract shows a special adaptation for the supply of fluid to the vitreous body, the lens, and the aqueous chamber. Where it is in relation with the vitreous, its secreting surface is extended by a series of grooves and ridges, and where it is in relation with the aqueous chamber it assumes a still more convoluted arrangement well suited for rapid secretion.[1]

The vitreous body has its chief attachments in this region; its limiting membrane adheres firmly to the ora serrata, and in advance of this point is separated from the secreting surface only by a single layer of cylindrical cells; the membranous septa which spring from the limiting membrane in this region are arranged in a manner peculiarly favorable for the entrance of fluid.[2]

Pathological anatomy points to the same conclusion. If we examine eyes which have been excised during the first stage of vitreous infiltration, we find an inflammatory exudation entering the vitreous body from this portion of the uveal tract, the region of its influx being limited posteriorly by the ora serrata. We find also that while a shrinking vitreous readily separates from the retina it always retains its firm connections in the region of the ora serrata. And, again, we find that while very extensive atrophy of the choroid does not necessarily affect the transparency or the volume of the vitreous body, disease in the ciliary region always tends to its destruction.

Experiments upon animals have amply confirmed the inferences previously drawn from these anatomical and pathological facts. Deutschmann found that removal of the ciliary processes together with the iris, which can be done in the rabbit without loss of lens or vitreous, and without causing inflammatory destruction of the eye, is followed by a total arrest of the secretion of the aqueous, and by atrophy of the vitreous

[1]See description by Brailey, Journal, September, 1882, p. 577.

[2]See description by Straub, Von Graefe's Archiv., vol. 24, part 4, p. 7.

body and lens.[1] Schoeler, Uhthoff, and others have found that after subcutaneous injections of fluorescine there is a speedy coloration of the aqueous fluid, and a more gradual coloration of the vitreous body, and that the colored secretion proceeds from the ciliary processes, and perhaps to a small extent from the posterior surface of the iris also.[2] Leplat has demonstrated the same thing by a somewhat different method; he gave subcutaneous injections of iodide of potassium, enucleated the eyes after various intervals of time, froze them and divided them into zones, and made a quantitative test for iodide in each zone.[3] These and many other experiments agree in showing that the fluids which nourish the vitreous body and lens and fill the aqueous chamber are secreted chiefly, if not entirely, by the ciliary portion of the uveal tract.

In what direction do these fluids travel, and where do they escape from the eye? The aqueous fluid passes from the posterior chamber forward through the pupil into the anterior chamber. It has been asserted that there is a current passing forward through the base of the iris, but the evidence is by no means conclusive. It is contrary to physical reasoning to suppose that while the pupil remains open the fluid will traverse the tissues of the iris: moreover, the stream through the pupil is proved by the fact that when the pupillary margin becomes entirely adherent to the capsule the fluid collects behind the iris with disastrous consequences.

The aqueous fluid escapes from the eye at the angle of the anterior chamber, by filtering through the ligamentum pectinatum into Schlemm's canal and the veins connected with it. This fact was established by Leber's well-known injection experiments, which showed also that the anterior chamber has no direct communication with the blood-vessels, and that the cornea, so long as its posterior epithelium remains entire, is permeated by the aqueous fluid.

The escape of fluid from the vitreous body has been the sub-

[1]Von Graefe's Archiv., vol, 26, part 3, p. 117, and Ophth. Rev., 1882, p. 149.
[2]See Ophth. Rev., vol. i p. 413.
[3]See Ophth. Rev., 1888, p. 84.

ject of much experiment and discussion, and is still not determined with absolute certainty. The question is whether it escapes at the papilla, or through the aqueous chamber, or in both these directions. Schwalbe has described certain lymph passages within the sheath of the optic nerve, which, he says, "find exit in the lymph passages of the skull, and convey not only the lymph formed in the optic nerve, but that also of the retina and vitreous."[1] Stilling has seen a considerable escape of fluid in this region under artificial pressure.[2] The injection experiments of Leplat, already referred to, appear to show that iodide of potassium injected subcutaneously enters the vitreous from the ciliary body and travels very slowly backward, and leaves it at the papilla.

Still more positive evidence is afforded by some experiments made by Gifford.[3] He injected with special precautions small quantities of water containing Indian ink or cinnabar in suspension into the vitreous of rabbits and other animals. The results were definite and constant. On the second day, or later, according as the injection was made farther backward or forward in the vitreous, the ophthalmoscope showed the particles collecting in the excavation of the papilla. On killing the animal a day or two later, the microscope showed the particles passing backward through the papilla, along the lymph spaces around the central vessels and leaving the nerve trunk with the vessels, and passing toward the sphenoidal fissure. They did not enter the sheath of the optic nerve. The current within this sheath has been proved by other experiments to move from the brain toward the eye.

In spite of the evidence put forward by these investigators, it has been difficult to accept the view they advocate, for certain facts seem to point the other way. Schoeler found that artificial occlusion of the supposed posterior outlet caused no discoverable reduction in the amount of fluid escaping from

[1] Graefe-Saemisch, Handbook, vol. i, p. 50.

[2] Report of Heidelberg Congress of 1885, p, 42.

[3] Archives of Ophthalmology, 1886, p. 153, and Ophth. Rev., 1886, p. 217.

the eye in a given time.[1] More recently, in experiments made by himself and Uhthoff, he failed to find any transit of fluorescine from the eyeball into the optic nerve or its sheaths. I myself, ten years ago,[2] injected solutions of carmine and of aniline purple into the vitreous of freshly excised pig's eyes, maintained the pressure for five or six hours, then froze the eye, and cut microscopic sections through the posterior pole; there was no color deeper than the superficial layers of the retina. Again I injected a colored fluid into the sheath of the optic nerve, after ligaturing the nerve behind the point of injection. The pressure employed was about double the normal intra-ocular pressure, and was maintained at this height during five hours. Microscopic sections showed no trace of fluid having entered the eyeball, although the tissues were deeply stained up to the anterior extremity of the sub-vaginal space.

In favor of the supposition that the vitreous fluid escapes through the aqueous chamber is the fact that it can easily pass in this direction. Leplat has lately proved, with regard to the living eye, that the fluid which rapidly refills the aqueous chamber after it has been emptied by puncture of the cornea is derived in large measure from the vitreous chamber; and this same refilling of the aqueous chamber occurs also in the dead eye, in which the vitreous is the only possible source of the fluid.

In order to test this matter still further, and to obtain, if possible, some information as to the amount of fluid which traverses the chambers in a given time, I undertook last year[3] another series of injection experiments on the freshly excised eyes of oxen, sheep and pigs, and, in a few instances, on the human eye after death. The most trustworthy results were obtained with sheep's eyes, for I could have an unlimited supply of these within a few minutes of death. The apparatus employed enables one to make a continuous injection of one

[1] Von Graefe's Archiv., vol. 25, part 4.
[2] Glaucoma, its Causes, etc., p. 142.
[3] Ophth. Rev., July, 1888, p. 193.

or both chambers under a known and constant pressure, and to measure the amount of fluid which passes through the chambers in a given time. The pressure can be varied at will by raising or lowering the reservoirs, and it can be kept absolutely equal in the two reservoirs by opening the tube which connects them; or, when this tube is closed, the reservoirs can be adjusted to give different pressures.

An air bubble in each of two graduated horizontal tubes serves to indicate the movement of the fluid. Its position is noted at regular intervals of time. The cubical content of the tube is known. A pressure of 30 centimetres of water, that is, 25 millimetres of mercury, was adopted as the standard pressure throughout, this being about the normal pressure.

The experiments were of several kinds. In one series I injected the anterior chamber only; in another the vitreous chamber only; in a third series, aqueous and vitreous were injected simultaneously under precisely equal pressures; and in a number of other cases I employed different pressures in the two chambers simultaneously, and varied the conditions in many different ways. The details have been described elsewhere; here I need only deal with the results. The following were the averages of ten experiments of each kind; the variations were not great:

When the anterior chamber only was injected, the escape during the first half hour was 785 cubic millimetres.

When the vitreous only was injected it was 275 cubic millimetres.

When the aqueous and vitreous were injected simultaneously under the same pressure it was 485 cubic millimetres, that is, considerably less than during injection into the aqueous chamber only.

This result, at first sight paradoxical, is explained by the varying position of the iris, and its effect upon the patency of the angle of the anterior chamber—the "filtration angle." When the anterior chamber only was injected, the iris was displaced a little backward; when the aqueous and vitreous

chambers were injected simultaneously under equal pressures, the iris remained in its normal position, or nearly so; when the vitreous only was injected the iris was displaced a little forward. In order to observe these displacements accurately, I froze the eyeballs solid while the injection was still going on, and bisected them.

In the fourth series of experiments the vitreous reservoir was raised to a higher level than the aqueous reservoir. For example, keeping the aqueous reservoir at 30 centimetres, as before, the vitreous pressure was raised to 35 centimetres. Under these circumstances the diaphragm between the two chambers, consisting of the lens, zonula, processes and iris, is displaced forward until the increased tension of the zonula balances the excess of pressure behind it. Equilibrium being established in the diaphragm, a stream passes through the zonula from the vitreous to the aqueous chamber, and fluid continues to enter the eye through the one needle, and to leave it through the other. The amount which escapes by filtration is then ascertained by subtracting the backward movement of the one bubble from the forward movement of the other. Now, under these circumstances, although the pressure in the aqueous chamber was as high as in the previous experiments, and the vitreous pressure was actually higher, the total escape was reduced to about 50 cubic millimetres in the first half hour. In the frozen and bisected eye the iris-base was found to be pushed forward, and in places visibly in contact with the periphery of the cornea. By placing the vitreous reservoir 15 centimetres higher than the aqueous reservoir it was possible to empty the anterior chamber almost completely, and to apply the whole iris close to the cornea; and under these circumstances the escape by filtration from the whole eye appeared in some instances to be entirely arrested.

Similar experiments upon the freshly-excised eyes of oxen, and in one instance on a freshly-excised healthy human eye removed with an orbital tumor, gave closely similar results.

With regard to the escape at the papilla I made some

further experiments with the smaller apparatus. A circular piece, including choroid, sclera, retina and optic nerve is cut from the back of a sheep's eye immediately after death and placed in the box, and the inner tube is tightly pressed down upon it by screwing on the cap of the box. The inner tube is then filled with colored fluid and connected by a flexible tube with a graduated glass tube and reservoir, as in the other apparatus. Under a pressure of 30 centimetres, as before, there was no perceptible exudation and no coloration on the outer surface after several hours.

These experiments show several points of importance with regard to the freshly excised eye. They show, firstly, that fluid injected into the vitreous chamber escapes chiefly, if not entirely, through the aqueous chamber; secondly, that a slight excess of pressure in the vitreous chamber displaces the lens and iris forward, compresses the filtration angle, and impedes the escape of fluid; thirdly, that there is little, if any, escape at the papilla. With regard to the currents in the living eye, they give, of course, no positive information.

(Since this lecture was delivered I have read with much interest that Dr. Leplat, adopting a method nearly the same as that above detailed, has made a further series of experiments upon living animals. His results confirm to a large extent those obtained by myself with the freshly-excised eye. He concludes that the escape at the papilla is about one-fiftieth of the escape at the filtration angle.)[1]

If we compare these various observations concerning the movements of the vitreous fluid, it is not difficult, I think, to reconcile the apparent discrepancies.

It appears certain, from the movements of solid particles observed by Gifford, that there is a current passing backward in the vitreous body and escaping along the lymph-passages which surround the central vessels of the optic nerve. It appears equally certain that this current moves very slowly, and that the amount escaping in a given time is extremely small

[1]Annales d'Oculistique, January February, 1889.

as compared with that from the aqueous chamber. Whether the small perivascular spaces in the papilla are rendered impervious by excision of the eye, or whether a small quantity of fluid does actually traverse them during artificial injection of the vitreous chamber, it is difficult to determine. In any case the absence of visible filtration here presents a striking contrast with the free escape which occurs at the filtration angle. It remains uncertain, I think, whether there is a persistent stream from the vitreous to the aqueous chamber. But we have seen that fluid can pass very readily in this direction under a slight excess of pressure in the vitreous chamber; and it seems probable that so long as the partition remains permeable, and the fluid diffusible, any excess of pressure in the vitreous chamber will relieve itself in this way. An intercommunication of this kind between the two chambers appears to be necessary for the maintenance of the lens in its normal position.

Our knowledge of these currents may, then, be briefly summarized as follows: The fluids which nourish the vitreous body and lens, and fill the aqueous chamber, are secreted chiefly by the ciliary portion of the uveal tract. The larger part of the secretion passes directly into the aqueous chamber, forward through the pupil, and out at the filtration angle. A very much smaller portion passes backward through the vitreous body, and escapes at the papilla. The hyaloid membrane and zonula which separate the two chambers are readily permeable by the vitreous fluid. The pressure which the fluid exerts against the walls of the chambers is equal to about 25 millimetres of mercury, and is the same or nearly so, in the two chambers.

To conclude this physiological part of the subject, I may point out that while the circulation of the intra-ocular fluid is necessary to the eye as a living organ, its pressure is necessary to it as an optical instrument—an instrument which is built entirely of soft materials, but which, nevertheless, can adjust itself with precision both for direction and for distance. In the larger chamber, where there are no moving parts,

the fluid is supplemented by a transparent fibrous tissue, which adds to the safety of the organ. In the smaller chamber there is fluid only, so that the curtain which regulates the admission of light may have perfect freedom of movement. In both chambers the fluid exerts that particular degree of pressure which suffices to maintain the form of the globe, and gives precision to the action of the muscles, external and internal, but does not embarrass the circulation of the blood, and nutrition of the tissues, or the transmission of nerve currents within the organ.

When the intra-ocular pressure rises above these physiological limitations, we get that complex disturbance which we call glaucoma.

Predisposing Causes of Primary Glaucoma.—The ciliary processes are highly vascular and vary in size, according to the quantity of blood in their vessels. If the free space at their disposal be insufficient for these variations, they will at times press unduly against the adjacent parts, internally against the lens margin, anteriorly against the iris-base. I think it can be shown that an undue proximity between the margin of the lens and the surrounding parts, in other words, an insufficient circumlental space, predisposes the eye to glaucoma. This idea was propounded in a work of my own published ten years ago.[1] It was put forward at that time as a hypothesis, and it has served the true purpose of every hypothesis, good or bad —it has suggested fresh lines of inquiry.

Supposing the circumlental space in any given eye to be insufficient, the fault may lie presumably either in the lens, or the parts which surround it. We know that the liability to glaucoma is greater in the old than in the young; the question therefore arises: Does the relation of the lens to the surrounding parts alter with the advance of life? In the year 1880 I examined, with regard to this point, five pairs of healthy eyes taken from adult male subjects, varying in age from 21 to 90, and I found a well-marked increase in the size of the lenses

[1] Glaucoma, its Causes, etc., London, 1879.

from the youngest to the oldest.[1] A more thorough investigation naturally followed; 156 lenses removed from the dead subjects were examined. They belonged, in nearly equal numbers, to the six decades of life between 20 and 80, and in smaller number to the decade 80 to 90. Each lens was accurately weighed, and then measured as to its volume, by means of an apparatus devised for the purpose. In most cases the linear dimensions were measured also. Opacity when present was noted. The specific gravity was calculated in each case from the weight and volume. Details of the method and of the precautions taken against error have been described elsewhere.[2] Here it is only necessary to state the results.

The crystalline lens, so long as it remains healthy, increases in weight and in volume throughout the whole of life. During the forty years between 25 and 65 years of age, it adds about one-third to its weight, one-third to its volume, and one-tenth to its diameters. The specific gravity appears to vary a little in individual cases, but shows no decided change with the advance of life. Lenses which are becoming cataractous are, as a rule, smaller than healthy lenses belonging to the same period of life. These are anatomical facts; physiology explains them.

The lens is derived from the cuticular epiblast, and in its mode of growth is analogous to the cuticle. But its cells, unlike those of the cuticle, are not cast off as they grow old; they are laid down layer upon layer within a closed capsule, the younger fibres surrounding the older. In consequence of this unique arrangement, and in spite of the shrinking of the older cells, which form the nucleus, the growth of the lens does not cease with that of the rest of the body, but is continuous, unless some morbid process intervene, thoughout the whole period of life. In advanced life the process of growth often fails; then the shrinking nucleus tends to separate from the softer cortex,[3] and senile cataract begins; accordingly, the lens

[1] R. Lond. Ophth. Hosp. Reports, vol. x, p. 33.

[2] Trans. Ophth. Soc., 1883.

[3] Becker, Anatomy of the Healthy and Morbid Lens, see Ophth. Rev., vol. ii.

with incipient cataract is smaller than the healthy lens of the same age.

Now, the structures which surround the lens attain their full dimensions at the commencement of adult life, or even earlier. I shall have to point out immediately that the diameter of the cornea increases little, if at all, after the fifth year. Hence it comes about that as age advances the lens steadily encroaches upon the space in which it lies. Its margin comes into closer relation with the ciliary processes. The precise relation of these parts in the living eye cannot be ascertained, for it is altered by death and by excision, but the change in question is obvious when we examine eyes of very different ages. Its anterior surface approaches nearer to the cornea, and thereby diminishes the depth of the anterior chamber. The shallow anterior chamber of old age has been supposed to indicate an advance of the whole lens toward the cornea, but such an advance has not been proved or explained, and the idea is not reconcilable with the change of refraction which actually occurs. A simple advance of the lens in an emmetropic eye would cause myopia, whereas the tendency in advanced life is to hypermetropia.

The increased size of the lens is itself, I think, to a large extent, the cause of the acquired hypermetropia of advanced life. If a lens be enlarged symmetrically—that is, if its several diameters be increased in equal proportion—its focal length will be increased in the same proportion. Other things being equal, therefore, the focal length of the human lens must increase as its size increases. The result may, of course, be modified by changes in the index of refraction, or by disproportionate enlargement in one or other diameter; but it is clear that the growth of the lens cannot be omitted, as hitherto, from the calculation. The dimensions of an aged but healthy lens are very different from those which are given in books as the average dimensions of the adult lens; thus, in the Graefe-Saemisch *Handbook* (vol. i, p. 45) the average antero-posterior diameter is given as 3.7 millimetres, whereas in elderly persons I have found it 6, 6.5, and even 6.75 millimetres.

As the result of this inquiry the glaucoma question stood thus: The lens steadily increases in size as life advances. If the size of the lens is an important factor in glaucoma, the liability to glaucoma should steadily increase in like manner. Does it so increase? With the help of many friends, members of the Ophthalmological Society, I was able to collect accurate data concerning 1,000 cases of primary glaucoma.[1] The cases were tabulated on a uniform system, indicating the sex of the patient, the age at which the glaucoma began, and the type of the disease, whether chronic, subacute or acute. The figures so obtained indicated the relative frequency of glaucoma in the several decades of life. These figures were then adjusted to the number of persons, males and females, living in each period of life, and thus the liability belonging to each sex and each life-period was ascertained. The following are the salient points.

A. *Frequency.*—1. Primary glaucoma is extremely rare in childhood and youth. Not one per cent of the cases met with begins earlier than the 20th year (5 per 1,000 belong to the second decade). 2. Its frequency increases, slowly at first, more rapidly later on, in each decade, until about the 60th year; between 60 and 70 it is about as frequent as between 50 and 60; after 70 its frequency diminishes. 3. Cases beginning after 50 are about twice as numerous as cases beginning before 50 (679 and 321 per 1,000.) 4. Females suffer in rather larger numbers than males (569 and 431 per 1,000). 5. The chronic non-congestive form is rather commoner in males than in females (253 and 223 per 1,000). 6. The acute and subacute congestive forms are much commoner in females than in males (346 anb 178 per 1,000).

B. *Liability.*—7. The liability to primary glaucoma is extremely slight in childhood and youth as compared with the later periods of life; thus at 15 years of age it is at least a hundred times smaller than at 65. 8. It continually increases up to and during the seventh decade, that is, the ten years be-

[1]Trans. Ophth. Soc., 1886.

tween 60 and 70; between 60 and 70 it is more than twice as great as between 40 and 50. 9. After 70 years of age the liability to glaucoma appears to decline considerably; it is probable, however, that the statistics relating to this period do not correctly represent the frequency of the disease, for very old people do not seek advice so easily or so willingly as those who are younger. 10. The liability of females is greater than that of males in a ratio probably of about 6 to 5. 11. The extra liability of females pertains to the whole of life, except, perhaps, the periods before 30 and after 70, concerning which the data are too few to justify a generalization. 12. The extra liability of females relates very markedly to the congestive forms of the disease, not to the non-congestive.

There is, then, a certain parallelism between the increasing liability to glaucoma and the increasing size of the lens, which accords well with the supposition that a diminished circumlental space predisposes to glaucoma.

Permit me now to ask your attention to another anatomical fact which seems to point in the same direction. Every operator must sometimes have been struck, when performing an iridectomy for glaucoma, by the apparent smallness of the cornea. The idea suggested itself that a small cornea might indicate a small globe, or at least a small ciliary zone, and might thus point to another cause of insufficiency in the circumlental space. I have endeavored to elucidate this point by systematic measurements of the cornea in healthy and in glaucomatous eyes. The instrument employed is a keratometer devised for the purpose. It combines a millimetre scale with a convex lens, and, by a simple optical principle, enables one to measure accurately without touching the eye or alarming the patient. I have not attempted to measure to less than half a millimetre.

Fifty-four persons suffering in one eye or in both from primary glaucoma, and 330 persons whose eyes were healthy, apart from trivial affections and errors of refraction, were examined. The measurements were tabulated according to sex, age and refraction. The list contains many cases of high hypermetro-

pia and high myopia. The results may be generalized as follows:

The cornea of the healthy eye, or at least its visible part, attains its full diameter very early in life. Between 5 and 10 years of age the average horizontal diameter is 11.6 millimetres; between 10 and 20, and again between 20 and 40, it is exactly the same. After 40 it appears to be slightly smaller, namely, 11.4 millimetres. The dimension varies in individual cases; but at all ages from 5 to 90 it usually lies between 11 and 12 millimetres. (In four persons out of the 330 it was 12.5, and in one 13.5. In eight persons it was 10.5. These eyes appeared perfectly healthy, and were the only exceptions). Small corneas are met with, of course, together with congenital cataract and nystagmus in obviously microphthalmic eyes, but such cases are not included in my list.

The average diameter is the same in the two sexes, and it is the same in hypermetropic, emmetropic, and myopic eyes. There is no difference in the average, even between highly hyperopic and highly myopic eyes. There is very rarely any difference between the two eyes of the same individual, and this is true even when they differ widely in refraction.

In persons suffering from primary glaucoma the cornea is often small, that is, the horizontal diameter measures 10.5 millimetres or less. Among the glaucoma patients examined it was small in 32 per cent. Among other persons of more than 40 years of age it was in only 5 per cent. To put the matter in a more striking way; 28 persons out of the whole number examined had small corneas, and of these 28, 20 had glaucoma; moreover, in 6 of these the cornea measured only 10 millimetres, a smaller dimension than was found in any unaffected person.

Those who had small corneas at all had it in both eyes, though only one eye might be glaucomatous. Thus, a man (J. D.), aged 66, had a chronic non-congestive glaucoma of many months' duration in the left eye; the right was perfectly healthy. Both eyes were emmetropic; both corneas measured 10 millimetres horizontally. Such cases prove that the

smalless of the cornea precedes the glaucoma and is not caused by it.

In four cases both corneas were small, but one was smaller than the other; in each case the smaller cornea belonged to the glaucomatous or to the more glaucomatous eye.

The small cornea is often oval in shape, the vertical diameter being shorter than the horizontal. I am not sure whether this oval shape is more frequent among small corneas than among those of full size.

Since my attention was first directed to the point it has happened to me several times to be struck, on first glancing at a patient, by the smallness of the cornea, to suspect the presence of glaucoma on that account, and to find it in one or both eyes. As to the frequent association of the two conditions there is no doubt; as to the meaning of it I cannot speak with certainty.

Are these small corneas small from youth upward, or do they become so in later life? We know that the cornea is nourished by the vessels of the conjunctiva and sclera, and that in shrinks to a very small size in some destructive diseases of the eye; its seems possible, therefore, that even in good eyes it may shrink a little when senile changes in other tissue sets in. As a fact, small corneas seem to be commoner in elderly than in young people. On the other hand, they are not entirely absent even among the young, and may in the young also be associated with glaucoma. At a meeting of the Ophthalmological Society on March 11, 1886, Mr. Hartridge showed a case of non-congestive primary glaucoma in a girl aged 14—a very rare condition at that time of life. One eye only was affected. Both corneas were strikingly small. Mr. Hartridge kindly measured them afterward, at my request. The diameters were 10 millimetres vertically, 10.5 millimetres horizontally.

The term "microphthalmos" denotes that the eyes are very obviously below the normal size, and in such eyes the small cornea is often associated with a shrunken and degenerated lens, but not always. Microphthalmic eyes with healthy

lenses are, I believe, very prone to become glaucomatous, and in one such eye examined by Hocquard and Masson,[1] the lens was found to be much too large for the eye; speaking more correctly, the eye was much to small for the lens.

In some of my own specimens I believe that a similar disproportion between the lens and its surroundings may be made out, though the point is difficult to determine. Further, I may remind you that in one form of secondary glaucoma an alteration in the size of the lens certainly plays an important part; the swelling which follows laceration of the lens capsule, either by accident or by operation, is very apt to induce glaucoma, and more so in elderly people, in whom the lens is already large, than in children in whom it is comparatively small.

Again, there is a third anatomical condition which, when present, must diminish the circumlental space—excessive size or prominence of the ciliary processes. Unfortunately, we cannot see these organs in the living eye, and we cannot learn their antecedent condition from eyes which have been blinded by glaucoma. We can, however, gain important evidence from eyes which have suffered from glaucoma, and have been quickly cured. Such evidence is to be found in a case described by Fuchs.[2] The patient was a woman aged 66; both eyes were attacked by acute glaucoma at intervals of one year, and both were permanently cured by iridectomy. They were examined after death several years later. In both eyes the attack had been of short duration; in the second eye only two days, so that, except for the coloboma, it had probably altered the conditions of the eye but little. I extract the following points from the published description: The ciliary body showed a remarkable enlargement, both as regards the muscle and the processes. The processes extended almost to the lens on the one side and to the iris on the other. The angle of the anterior chamber was considerably narrowed by the altered position of the iris-base, so that a slight swelling of the

[1]Archives d' Ophth., 1883, p. 231.

[2]Von Giaefe's Archiv. vol xxx, part 3, p. 123

processes would have pressed the iris against the cornea. The circumlental space was remarkably small, not through of the ciliary processes. The tissues of the ciliary body were normal, not inflamed. The condition was simply a hyperplasia, or perhaps only a physiological peculiarity.

In this connection it must be noted, also, that the hypermetropic eye, the ciliary muscle of which is especially prominent in the direction of the lens, is particularly liable to glaucoma.

These facts appear to justify the belief that an insufficient circumlental space predisposes the eye to glaucoma. The insufficiency may depend upon several causes acting singly or in combination. First, there is the increasing size of the lens, which explains the increasing liability which comes with advancing years. Secondly, there is, in some cases, the subnormal size of the globe or of the ciliary zone, sometimes depending on insufficient growth, sometimes possibly on senile contraction. Thirdly, there is the excessive size or prominence of the ciliary processes, a condition which may perhaps be present at any time of life, but which will certainly be more likely to produce complications in advanced life, when the lens is large, than in youth, when it is small.

There are doubtless other prodisposing causes, but we have at present, I think, no certain knowledge with regard to them.

Exciting Causes of Primary Glaucoma.—For these we must look to conditions which overfill the uveal tract with blood. The common antecedents of glaucomatous attacks are conditions such as heart weakness, bronchitis, hepatic congestion, constipation, cold, hunger, bodily fatigue, mental exhaustion and others, which congest the venous system. Again, the arterial hyperæmia which accompanies some forms of trigeminal neuralgia, or which follows a scratch or contusion of the eye itself, will suffice to light up a glaucoma where there is a strong predisposition to it.

Congestion of the uveal tract involves enlargement of the ciliary processes, and this, if it be extreme, or if the space at the disposal of the processes be insufficient, leads to compres-

sion of the infiltration angle. An advancement of the lens toward the cornea usually accompanies the onset of the high tension; the cause of this is not quite clear. It is probable, I think, that the ciliary processes being compressed between the lens and iris secrete an undue proportion of fluid into the vitreous chamber, and that the filtration of fluid from the vitrous to the aqueous chamber is impeded. In some forms of glaucoma, especially the chronic form and that which sometimes accompanies the advanced stage of retinitis pigmentosa, there are, I suspect, changes in the hyaloid and anterior part of the vitreous which obstruct the escape of surplus vitreous fluid into the aqueous chamber, and tend thereby to enlarge the vitreous at the expense of the aqueous chamber. Hæmorrhagic and serous exudation into the vitreous chamber appear sometimes to act in the same way. In any case the advance of the lens and zonula is an important factor. The experiments described in my first lecture showed that a very slight excess of pressure in the vitreous chamber drives the lens and ciliary processes forward, compresses the filtration angle, and checks the escape of the fluid from the eye.

Acute glaucoma is often spoken of as an inflammatory disease, and undoubtedly its course is constantly attended by inflammatory changes, but does it originate in inflammation? Nearly five and twenty years ago, Sir William Bowman wrote: "Glaucoma is in its essence not an inflammation, and, when inflammatory, only so as it were by accident or complication."[1] To my mind, acute glaucoma is just as much an inflammatory disease as strangulated hernia, and no more. There is, I think, considerable likeness between these two diseases, and I am told that the late Mr. George Critchett was in the habit of drawing the same comparison. In the displacement of the bowel we have a condition, mechanical in its origin, which, for a long period of time, may have no serious consequences, but which may at its very outset or at any later time, under a slight constriction, be transformed into one of

[1]R. Lond. Ophth. Hosp. Reports, vol. v, p. 10.

acute and dangerous strangulation, with intense engorgement of vessels and outpouring of serum in the directions of least resistance. In the eye threatened by glaucoma we have an unfortunate relation of parts, which, though not itself a disease, may lead, through a little further encroachment upon the already narrowed space, to one of the most formidable of ocular disorders, involving stoppage of the intra-ocular currents, throttling of the circulation, and escape of the serum into the transparent media and the conjunctiva. Just as the taxis will occasionally remedy the displacement and terminate the danger in the one case, so in a few instances will eserine reopen the outlets and relieve the tension in the other; but as in strangulated hernia it is generally necessary to at once relieve the constriction with the knife, so in most cases of acute glaucoma our only means of cure is to promptly unlock the eye by iridectomy.

Now some pathologists, finding in eyes blinded by glaucoma, various inflammatory changes, exudation of leucocytes, cell-proliferation, adhesion between adjacent surfaces, and vascular changes, declare that inflammation is the starting point of the malady. It would, I think, be as reasonable to say that the exudations, the false membranes and the adhesions which are found in the sac of a hernia prove an inflammatory origin for that disorder.

Phlebitis affecting the vortex veins in their course through the sclera has been described as a cause of primary glaucoma.[1] I have examined these veins in many of my specimens, and in some of them have found the changes in question. Unfortunately, the microscope will not tell us at what stage of the disease they begin, but to me it seems more probable that they are consequences than that they are initial causes of the high pressure. A primary phlebitis, even if it began in the vortex veins, would surely extend beyond them, and its consequences would hardly be remediable by any operation. Moreover, these changes in the veins are to be found in secondary glau-

[1]Birnbacher and Czermak, Von Graefe's Archiv., vol. xxxii, Part ii, p. 1

coma also, and here they are certainly not the initial causes.

Inflammations may doubtless be the starting point of primary glaucoma in some instances, but there is no evidence, I think, that it is the usual and essential cause. The way in which the premonitions of glaucoma come and go, the fact, a drop of atropine can excite a violent attack in an eye which had previously shown no signs of inflammation, and that a surgical operation permanently can put an end to the whole process, are strongly opposed to the doctrine that glaucoma is essentially an inflammation.

Accommodative strain is believed by some observers to be a potent exciter of glaucoma.[1] Probably it may sometimes act by congesting the ciliary processes, but it must be remembered that the liability to glaucoma is greatest at a time of life when the accommodation is in abeyance. Much bookwork is likely to be injurious, quite apart from the accommodative act, by reason of the stooping and the congestion of the head which it often involves.

Atropine, homatropine, duboisine, cocaine, in short, all the drugs which dilate the pupil, must be included amongst the exciting causes of primary glaucoma. It is easy to see that when the filtration angle is already dangerously narrow, the thickening of the iris-base which accompanies dilatation of the pupil may suffice to complete the blockade.

Finally, in connection with the causation of primary glaucoma, it is interesting to compare the liability of the two sexes as shown by the statistics already given. Men appear to be chiefly liable to the non-congestive, females to the congestive, forms, and the latter seem to be on the whole rather more liable than the former. Probably it would be more correct to say that while the liability to the simply non-congestive form is about equal in the two sexes, women are much more prone than men to congestive exacerbations, or even to anticipate the onset of the chronic disease by attacks of the congestive kind. This special tendency may reasonably be referred to

Walker, Trans. Internat. Med. Cong., 1881, Sect. Ophthal., p. 88, Schoen, Trans. ternat. Ophth. Cong., 1888, p. 257.

the greater instability of the vaso-motor system in women, and particularly to the disturbances of circulation which emanate from the generative organs. So far as regards the predisposition which depends on the build of the eye and the growth of the lens, men and women probably stand on the same footing, but as regards the exciting causes women have the disadvantage.

The causes of primary glaucoma, then, are various, and not yet completely known; but they are, I think alike in this, that they all lead to compression of the filtration angle. With that compression the glaucoma process begins. The escape of fluid is retarded and the intra-ocular pressure rises; the increasing pressure hinders the flow of blood through the choroidal veins, and aggravates the swelling of the ciliary processes; this, in its turn, increases the compression of the filtration angle. Moreover, the blocking of the circumlental space checks the escape of surplus fluid from the vitreous chamber, and the lens, pressing forward, intensifies the mischief. And, further, if any fluid still exudes from the turgid ciliary processes, it is albuminous and less diffusible than the normal secretion. Thus cause and effect react upon each other in a vicious circle, and the glaucoma intensifies itself.

In acute glaucoma we see the vascular element at its maximum, in chronic glaucoma at its minimum; in the subacute and intermittent forms it seems to ebb and flow under various influences which aid or embarrass the circulation in the uveal tract. The vascular element finds its complement and auxiliary (more marked in some cases, less marked in others) in the predisposing structural condition of the eye.

It would carry us far beyond the limits of these lectures to discuss the consequences of an increase of the intra-ocular pressure. They constitute, for the most part, the well-known symptoms of glaucoma. They form a complex group of changes resulting from obstructed circulation, suppressed secretion, and distention and yielding of the tunics.

It will be well, in conclusion, to inquire how far our present knowledge of the pathology of glaucoma accords with the

rules and methods of treatment which have been established by clinical experience.

Principles of Treatment.—If it be true that an increase of the pressure within the eye is the essence of the glaucoma process, a reduction of this pressure must be the essential object of our treatment. Experience shows that the only measures which retard or arrest the process are those which reduce the tension of the eye.

Glaucoma usually calls for operative treatment, for the due escape of the intra-ocular fluid can seldom be permanently re-established by any other means, but there are some cases which can be successfully treated without operation, and there are very many in which certain auxiliary measures are of great value.

Eserine sometimes rapidly relieves the high tension. It is the antogonist of atropine which, as we have seen, sometimes induces or aggravates high tension. Other myotics and mydriatics have similar effects. It is important to notice that these drugs cause no decided changes of tension in the healthy eye, and that such small changes as they do produce are usually the opposites of those in question, eserine tending to raise, and atropine to lower, the intra-ocular pressure. Their action in glaucoma, therefore, must depend on some abnormality in the glaucomatous eye. This obnormality lies unquestionably in the altered relations of the iris.

Eserine, by contracting the sphincter of the pupil, thins the iris, flattens its folds and pulls upon its peripheral insertion. If the filtration angle is compressed it tends to reopen it. Accordingly, we find that eserine is chiefly useful when this compression is slight or recent. In the sudden, but comparatively mild, attacks which come and go during the premonitory stage of primary glaucoma, it acts with admirable effect. In severe acute attacks, also, it may be useful if applied without delay; but in such cases the sphincter of the pupil is soon paralyzed, and the filtration angle is very firmly closed, hence the period during which it can give relief is soon past. In chronic, non-congestive glaucoma, eserine often lowers the tension for a time, but the improvement is seldom great or lasting.

In some forms of secondary glaucoma also—for example in that which sometimes follows hæmorrhage into the vitreous and that which is caused by lateral displacement of the lens—eserine sometimes acts just as in primary glaucoma.

In all forms of the disease in which it is unable to contract the pupil, and thereby to increase the patency of the filtration angle, eserine is useless. When it is useless it is certainly harmful, for it increases the hyperæmia and often causes pain. On this account the strength of the preparation employed and the frequency of its application should be the minimum which suffices to contract the pupil and to keep it contracted.

In one form of secondary glaucoma, namely, that due to the presence of the lens in the anterior chamber, eserine has been known to act as the immediate cause of the attack by occluding the pupil and thus leading to closure of the filtration angle, the very complication which, in the reversed position of the parts, it is often able to relieve—a striking proof that its effects depend upon the position of the iris. Eserine, therefore, is not a specific for high tension, but simply a means of combating a particular displacement of the iris, which is often, but not always, the immediate cause of high tension.

Atropine is harmful precisely in those conditions in which eserine is useful; it induces high tension by dilating the pupil, slackening and throwing the iris into folds, and thereby helping to cbstruct the filtration angle. When it cannot dilate the pupil it never, I think, raises the tension. In certain cases of secondary glaucoma in which the high tension is due to serous exudation and not to displacement of the iris, atropine, by subduing the inflammation, tends to restore the normal tension. This is not mere hypothesis. A lady had severe secondary glaucoma from circular posterior synechia, and was iridectomized in both eyes with good result. Nearly a year later she came under my care with recurrence of injection and high tension in one eye; she had been strictly warned by two oculists against the use of atropine; nevertheless, and against her inclination, I ventured to prescribe it, and the injection and tension quickly subsided.

Cocaine, like every other dilator of the pupil, has been known to induce glaucoma. On the other hand, this drug has the power, invaluable in glaucoma, of contracting the ciliary blood-vessels and diminishing the sensibility of the ciliary nerves. By combining cocaine with eserine in such proportions that the eserine shall have the mastery over the pupil, we get the advantages of both without the disadvantages. Whenever eserine is used in the treatment of glaucoma it should, I think, be combined with cocaine.

Morphine will sometimes cut short, and will often alleviate a glaucomatous attack; it acts probably by easing pain, lowering the blood-pressure, and at the same time promoting contraction of the pupil.

Sleep, even though of a very short duration, often dispels the mild premonitory attacks with which primary glaucoma begins. During sleep the pressure in the cerebral vessels falls, and the pupil contracts.

Warmth, food, and rest relieve, just as cold, hunger, and fatigue induce, these early and slight attacks.

These palliative measures, though often very useful, have seldom more than a transient effect, and any discussion of them would be likely to do more harm than good, if it were to obscure the fact that the true remedy for glaucoma in the great majority of cases is a timely iridectomy.

Iridectomy, as performed for the relief of glaucoma, consists in the formation of an incision which opens the anterior chamber very near to its periphery, together with the excision of the corresponding segment of the iris. Von Graefe, to whom we are indebted for this invaluable remedy, was unable to explain its mode of action, yet every detail which he laid down with regard to its performance is sanctioned and confirmed by the more advanced pathology of the present day.

Iridectomy appears to effect the cure of glaucoma in the following way: In the first place, the escape of the aqueous humor and, when there is much congestion, the escape of blood, immediately lowers the pressure in the chambers. This, in the next place, relieves the obstructed circulation. The turgid

ciliary processes subside, fluid drains away from the vitreous through the circumlental space, and the filtration angle reopens. Lastly, if the filtration angle reopens insufficiently, the lips of the wound, especially the inner lips, remain imperfectly united, and an abnormal outlet for the intra-ocular fluid is permanently established. The absence of a segment of the iris and the presence of a more or less permeable cicatrix are safeguards for the future.

With regard to the circumlental space, since iridectomy cannot alter the size of the lens, its efficiency must depend chiefly on subsidence of the ciliary processes, and must, therefore, be greater in the more congestive forms of the disease. With regard to the filtration angle, a complete reopening is more likely to occur when the compression is still recent than when it has lasted many days or weeks. Accordingly we find that iridectomy acts with the greatest certainty in acute and recent cases. In the two eyes examined by Fuchs, which had been permanently cured of acute glaucoma by iridectomy, the filtration angle was patent throughout the whole circle.

In chronic non-congestive glaucoma, iridectomy acts with less certainty. When it permanently lowers the tension it appears to do so rather by creating fresh outlets than by restoring the normal ones. During the healing process the fluid appears to find for itself new filtration channels in the cicatrix and the adjacent tissues. The lips of the wound do not come into close apposition, but are joined by a thin semi-transparent tissue, and the overlying conjunctiva remains slightly elevated by the fluid which escapes into it.

In non-glaucomatous eyes, iridectomy causes no permanent reduction of the tension, and in the eyes of animals it has been found to diminish rather than increase the patency of the filtration angle.[1] On this ground some writers have maintained that it cannot promote filtration in the glaucomatous eye. But what is the behavior of artificial openings and false passages in other parts of the body—for example, in the urinary organs,

[1]Schoeler, Trans. Internat. Med. Cong., Sect. Ophth., p. 100; see Ophth. Rev., vol i, p. 216.

the intestine, and the lachrymal sac? If the normal outlet is patent, the artificial opening closes rapidly and completely; if the normal outlet is closed, a vicarious channel is permanently established. The same rule applies to the eye.

In some cases of glaucoma, iridectomy fails. We get neither a reopening of the normal outlets nor the establishment of new ones. The failure may arise in several ways. The lens may be injured, and may swell up and occlude the wound. It may do the same thing through displacement forwards under excessive pressure from behind. The incision may lie too far from the periphery of the chamber. A purely corneal cicatrix appears to admit of little or no filtration.

Sclerotomy, whether performed with the linear knife according to De Wecker's method, or with the keratome as advocated by Snellen and others, aims at opening the anterior chamber near to its periphery, and leaving the iris intact. Its success in many cases proves that the essential part of an iridectomy is the incision of the sclera, not the excision of the iris; it does not prove, however, that the latter step is better omitted. The disadvantage of sclerotomy is that during the healing process the iris is apt to occlude the wound; in congestive glaucoma it has, I think, the further disadvantage that it does not, like iridectomy, immediately promote an escape of blood from the turgid vessels. It is, however, no part of my present purpose to discuss the details of these operations.

Artificial openings in other situations, for instance incisions made transversely through the ciliary region, and incisions which open the vitreous chamber only, though sometimes successful,are less to be trusted than a well-made iridectomy. It would appear that a filtration scar is more readily established in close proximity to the normal outlets than in any other part of the tunics.

Finally, from the pathological point of view, it might appear that primary glaucoma could be radically cured in its early stage by the extraction of the lens in its capsule, but the practical surgeon would shrink from attempting an extraction under such circumstances. The lens being healthy, would demand a

larger incision than is required for the cataractous lenses which we commonly extract, and it would separate from its attachments with great difficulty. The fact is interesting, however, that the intentional removal of the lens or its accidental escape after an iridectomy has proved distinctly beneficial in certain cases of glaucoma.

The treatment of glaucoma should not nowadays, I think, be called empirical. We know to a large extent the causes and nature of the morbid process, and we know the action of the measures by which we attempt to arrest it. It may be that our better knowledge of the causes will not supply us with better remedies than those which we now employ, but it will certainly enable us to employ them with more discrimination, more confidence, and more success.—*British Med. Jour.*

CORRESPONDENCE.

DEAR DR.—I have started a new Institution, which is named the New Amsterdam Eye and Ear Hospital, and situated at 212 W. 38th St., New York City. The Hospital was incorporated in April, 1888 and opened for the reception of Dispensary cases in June, since which time we have treated 700 patients and made 50 operations. The in-door department was opened in October. Our Board of Trustees consists of wealthy and well-known men, and I am the Surgeon-in-Chief.

Yours truly,

THOS. R. POOLEY.

NEW YORK CITY.

EDITORIAL NOTICE.

CONVENTION FOR THE REVISION AND PUBLICATION OF THE PHARMACOPŒIA OF THE UNITED STATES OF AMERICA.

To the Editors of all Journals of Medicine and Pharmacy throughout the United States of America.

It is suggested that you will have the kindness to call attention, in your editorial columns, to the call for a General Convention to assemble in Washington, D. C., at noon of May 7th, 1890, for the purpose of providing for a Revision and Publication of the Pharmacopœia of the United States of America; and that you will also request that every incorporated medical or pharmacal College, Association or Society desiring to be represented in the Convention will send to me its Corporate Title and a List of its Officers, addressed to care of Dr. Edwin H. Brigham, Assistant Librarian of the Boston Medical Library 19 Boylston Place, Boston, Mass., in order that I may prepare for publication, as directed by the Convention of 1880, a list of the bodies to be represented. Very respectfully,

ROBERT AMORY,

Boston, Mass., March 9, 1889. Pres't of the Conv'n of 1880.

Notice is hereby given that, in accordance with and by virtue of the authority vested in me by the Convention of 1880, I hereby call upon the several incorporated Medical Societies, incorporated Medical Colleges, incorporated Colleges of Pharmacy, and incorporated Pharmaceutical Societies throughout the United States, The American Medical Association and the American Pharmaceutical Association to elect a number of delegates, not exceeding three, and upon the Surgeon-General of the Army, Surgeon-General of the Navy and the Surgeon-General of the Marine Hospital to appoint, each, not

exceeding three medical officers to attend a General Convention for the Revision and Publication of the Pharmacopœia of the United States of America, to assemble in the City of Washington, D. C., on the first Wednesday of May, 1890 (May 7th), at 12 o'clock noon.

The several bodies, as well as the Medical Departments of the Army, Navy and Marine Hospital Service, are hereby requested to submit the Pharmacopœia to a careful revision, and to transmit the result of their labors to the Committee of Revision at least three months before the meeting of the General Convention.

The several Medical and Pharmaceutical bodies are hereby requested to transmit to me, as the President of the Convention of 1880, the names and residences of their respective delegates as soon as they shall have been appointed; a list of these delegates shall thereupon be published under my authority, for the information of the medical public, in the newspapers and medical journals in the month of March, 1890.

In the event of the death, resignation or inability of the President of the Convention of 1880 to act, these duties (in accordance with the resolution of that convention) shall devolve, successively, in the following order of precedence, upon the Vice-Presidents, the Secretary, the Assistant Secretary, and the Chairman of the Committee of Revision and Publication of the Pharmacopœia.

These officers are as follows: First Vice-President, Samuel C. Busey, M.D., of Washington, D. C.; Second Vice-President, P. W. Bedford, Ph.G., of New York; Secretary, Frederick A. Castle, M.D., of New York; Assistant Secretary, C. H. A. Kleinschmidt, M.D., of Washington, D. C.; Chairman of Committee of Revisision, Charles Rice, Ph.D., of New York; First Vice-Chairman of the Committee of Revision, Joseph P. Remington, Ph.M., of Philadelphia, Pa.; Second Vice-Chairman of the Committee of Revision, C. Lewis Diehl, Ph.G., of Louisville, Ky.

At the general convention held in Washington, D. C., on the fifth day of May, 1880, the organizations and bodies

enumerated in the Abstract of the Proceedings of the National Convention of 1880, on pp. xv. to xviii. of the United States Pharmacopœia of 1882—a list of which will be found appended to this call—were recognized as being entitled to representation.

If any body other than those admitted in 1880 shall desire a representation in the convention of 1890, it is suggested that the proof of incorporation, signed by the Secretary of State, of the State which shall have issued the charter, or by properly qualified public officials of the United States, be presented with the credentials of the delegation.

A blank form of certificate of appointment of delegates will be sent upon application by letter or to my address, care of Dr. Edwin H. Brigham, Assistant Librarian of the Boston Medical Library, 19 Boylston Place, Boston, Mass.

(Signed.) ROBERT AMORY,
President of the Convention of 1880.

Boston, March 9, 1889.

LIST OF INCORPORATED BODIES AND OF GOVERNMENT DEPARTMENTS REPRESENTED IN THE PHARMACOPŒIAL CONVENTION OF 1880.

Connecticut Medical Society.

Iowa State Medical Society.

Massachusetts Medical Society.

Medical Society of the State of New York.

Medical Society of the State of North Carolina.

College of Physicians and Surgeons in the City of New York.

College of Physicians, Philadelphia.

Medical and Chirurgical Faculty of Maryland.

Medical Society of the District of Columbia.

New York Academy of Medicine.

Philadelphia County Medical Society.

Albany Medical College, Med. Dept. of Union University, Albany, N. Y.

Bellevue Hospital Medical College, New York.

College of Medicine, Syracuse University, Syracuse, N. Y.

College of Physicians and Surgeons, Med. Dept. of Columbia College, New York.

Dartsmouth Medical College, Hanover, N. H.

Department of Medicine and Surgery of the University of Michigan, Ann Arbor.

Jefferson Medical College, Philadelphia, Pa.

Medical College of Indiana, Med. Dept. of Butler University, Irving, Ind.

Medical Department of Howard University, Washington, D. C.

Medical Department of Iowa State University, Iowa City.

Medical Department of the University of Georgetown, Washington, D. C.

Medical Department of the University of Maryland, Baltimore.

Medical Department of the University of Pennsylvania, Philadelphia, Pa.

Medical Department of the University of Virginia, Charlotteville, Va.

Miami Medical College, Cincinnati, O.

Missouri Medical College, St. Louis.

National Medical College, Med. Dept. of Columbia University, Washington, D. C.

Rush Medical College, Chicago.

University of the City of New York, Med. Dept., New York.

Woman's Medical College of the New York Infirmary, New York.

Women's Medical College of Pennsylvania, Philadelphia, Pa.

Chicago College of Pharmacy, Chicago, Ill.

Cincinnati College of Pharmacy, Cincinnati, Ohio.

College of Pharmacy of the City of New York, N. Y.

Louisville College of Pharmacy, Louisville, Ky.

Maryland College of Pharmacy, Baltimore, Md.

Massachusetts College of Pharmacy, Boston, Mass.

National College of Pharmacy, Washington, D. C.

Pennsylvania College of Pharmacy, Philadelphia, Pa.
Philadelphia College of Pharmacy, Philadelphia, Pa.
St. Louis College of Pharmacy, St. Louis, Mo.
University of Michigan, School of Pharmacy, Ann Arbor, Mich.
Medical Department of the U. S. Army.
Medical Department of the U. S. Navy.
U. S. Marine Hospital Service.

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EXTRACTION OF CATARACT WITHOUT IRIDECTOMY, OR SIMPLE EXTRACTION

BY DR. S. C. AYRES, CINCINNATI, OHIO.

Read at the Ohio State Medical Society, Youngstown, May 24, 1889.

After holding sway for a period of twenty-five years, it seems probable that Graefe's operation for the extraction of cataract is about to give way for another and more successful method.

The operation devised by the brilliant Graefe was a great improvement on the methods in vogue at that time and statistics go to prove the value of his innovation. But recently there has been a return to the old corneal flap without an iridectomy and the operation is called simple extraction.

The coloboma caused by the iridectomy has long been a source of annoyance to the operator on account of its cosmetic results, and also of some loss in acuity of vision to the patient from the unnatural size of the pupil.

To extract the lens and preserve the shape, size and activity of the pupil and at the same time improve the vision must certainly be the aim of the operator and must constitute the "ideal operation."

It seems now that we are about to accomplish this desideratum, if we have not already done so. Two things have combined to make possible such results, as I shall presently mention and they are: First, Graefe's knife for cataract operation, and second, antiseptic measures to prevent suppuration.

Whatever may become of Graefe's operation as it is known all over the world, his knife is likely to live. It may be modified, but to him will always belong the credit for superceding the old triangular knife by the long narrow blade now in use.

Antisepsis, in its relation to cataract extractions, plays as important a role as it does in any other operation. Antiseptic precautions should be carried out with scrupulous care in every case, so as to make the statistics of this operation show the best possible results.

Carefully prepared statistics of surgical operations made by reliable men must have great weight in deciding the propriety and impropriety of any operation. We look to men who have large opportunities for the results of their work. Men in more limited fields must be influenced more or less by those whose fields are more extended.

In cataract operations, the older cities of Europe furnish the largest number pro rata, while in our country the Eastern cities have apparently more than the Western. In considering the results of cataract extractions we must naturally refer to the cases reported by Dr. Knapp, of New York City, whose extensive experience in Europe and this country makes his statistics of the greatest value.

He has recently completed his report of 1,000 cases and it is a matter of great interest to see what his results have been, and I shall refer to them hastily: In his third hundred he had 6 per cent of loss, 3 per cent of imperfect results, and 91 per cent of good results, but among the latter not one of them is reported as having perfect vision.

In the fourth and fifth hundred cases, which are reported together, there was a total loss of 11.5 per cent, a moderate result in 6.5 per cent, and good results in 82 per cent.

In the sixth hundred there was a loss of 10 per cent, moderate results in 1 per cent and good results in 89 per cent.

In the seventh hundred there were 5 per cent of failures, 7 per cent of moderate results, and 88 per cent of good results.

In the eighth hundred there was a loss of 2 per cent, moderate results in 8 per cent, and good results in 90 per cent.

These operations were done after Graefe's method. The discission of the capsule was modified latterly, but practically they all come under one class.

The next hundred which he reports were done by the simple extraction, the old method which has been recently revived, without an iridectomy. The increased percentage of good results is at once apparent as there was in this series a loss of only 1%, moderate results in 3%, and good results in 96%.

Most striking evidence of the superiority of this operation is shown in the number of cases which have a vision of $^{20}/_{\text{xx}}$, which in this series amounted to 21%. This phenomenally good result is due to the fact that Dr. Knapp makes discissions of the capsule very soon after the extraction is done, and in that way as an ultimate result obtains a much higher percentage of perfect sight than he ever did before.

His last hundred cases are still better; he reports here a loss of 1 case, moderate results in 2%, and good results in 97%. The ultimate result of this series is something unprecedented in the history of cataract extraction so far as my access to reports is concerned.

He has a total result of perfect vision in 30%. This speaks louder in praise of this operation than words. It is hard to say how much the final results will be impoved, but certainly so far the statistics are decidedly in favor of simple extraction without iridectomy.

Simple extraction without iridectomy is not possible in every case. It is not advisable in over-ripe cataracts nor in cases where there are posterior synechiæ. There are also complicated cases where the old method would be better.

So far I have had only 32 cases of simple extraction and I

report them for what they are worth. They are certainly encouraging as showing a fair average of good results.

The cases are as follows:

1. W. W. æt., 30. Cataract semi-hard, no complications. Extraction without iridectomy. Spontaneous reduction of iris. No inflammation. Pupil clear, round, central and active. V=0.5.

2. P. R., æt. 69. Extraction without iridectomy. Spontaneous reduction of iris. No reaction. Pupil round and central. V=0.5

3. J. K., æt. 52. Extraction without iridectomy. Spontaneous reduction of iris. No reaction, round central pupil. Cornea nebulous from old keratitis, but vision excellent considering this complication. V=0.1.

4. Mrs. C. H. Cataract mature L. e. and hyper-mature R. e. Operation R. e. Lens removed without complication. There was a small cystoid cicatrix at the inner angle of the wound, but it caused no irritation. No reaction. Pupil drawn upward and oval in shape. Vision good. 0.1.

5. Operation L. e. In making the corneal section, the free edge of the iris fell over the knife and in cutting out the pupil was enlarged slightly upward. I did not excise the iris to its periphery, but completed the operation as usual. No reaction. Excellent recovery with pupil enlarged upward. V=0.1.

6. V. D. æt., 69. Cataract mature R. e. Simple extraction, spontaneous reduction of iris. Second day wound spread and iris prolapsed. Healed with cystoid cicatrix. Two months later excised cicatrix. V=0.2.

7. Mrs. E. J. C., æt. 62. Cataract not quite ripe. Extraction without complication. Iris reduced spontaneously. A small quantity of soft cortical substance remained in the pupil which was quietly absorbed. Not the slightest reaction. V=0.3.

8. J. M. B., æt. 68. Extraction without complication. Iris reduced spontaneously. Small quantity of soft cortical substance remained in the pupil. No reaction. On eighth day

struck eye with his hand and panophthalmitis followed and the eye was entirely lost. V=0.

9. Dr. R. Cataract hypermature, waxy lens. Simple extraction. Spontaneous reduction of iris. The next day his son fainted and fell on the bed his hand striking his father's eye. This caused a rupture of the wound and prolapse of the iris. Excised iris. Marked chemosis of conjunctiva and infiltration of upper lid. Inflammation subsided in three weeks. Could see objects in the room. V=1/xx.

10. W. W. E., æt. 76. Simple extraction. Spontaneous reduction of iris. Large amount of soft cortical; some remained. Cystoid cicatrization formed in the course of two weeks. Cortical substance absorbing when discharged. V=1/xx.

11. Dr. W. G. R.f æt. 72. Simple extraction. Spontaneous reduction of iris. Pupil clear and round. Fourth day the wound opened but iris did not prolapse; closed again in three days. V=O. 4.

12. S. T. H., æt. 83. Simple extraction. Spontaneous reduction of iris. V.=0.2.

13. Mrs. H. S., æt. 69. Simple extraction. V.=0.2.

14. Mrs. E. C., æt. 70. Waxy, semi-transparent lens, large and broad. Simple extraction. Rupture of iris at pupillary margin. Large amount of pigment scraped off. V.=0.1.

15. M. N., æt. 82. Simple extraction. Lens mature. No complication. Pupil round and active. V=0.1.

16. Miss A. N., æt. 58. Simple extraction. No inflammation or reaction. Pupil oval but clear. V=0.4

17. H. H., æt. 63. Simple extraction. Lens mature. V =0.1.

18. Col. I. H. P., æt. 79. Simple extraction. Pupil central, round and active. V=0.7.

19. Mrs. M. A., æt. 29. Prolapsus iridis and excision. V= 0.1.

20. Mrs. G. K., æt. 47. Simple extraction. Pupil central, round and active. V=0.4 seventeen days after the operation.

21, E. C., æt. 63. Simple extraction. Lens capsule came out before the lens, removed by slide manœuvre. V=0.1.

22. Mrs. M. L., æt. 62. Simple extraction. Pupil central but irregular from two points of adhesion to membrane. V=0.2.

23. Mrs. F. J. W. Simple extraction. Prolapsus iridis and excision. V=0.1.

24. Mrs. S. J. K., æt. 79. Cataract over-ripe. V=0.1 two weeks after the operation.

25. L. R. H., æt. 51. Simple extraction. Iris replaced with spoon. V=0.3 ten days after the operation.

26. Mrs. J. P. P., æt. 74. Cataract over-ripe. Spontaneous replacement of iris. Seven days after operation. V=0.2.

27. Mrs. J. P. P. L. e. Simple extraction. Spontaneous replacement of iris. V=0.2.

28. Mrs. L. E. W. æt. 74. Simple extraction. Spontaneous replacement of iris. Cystoid cicatrix. V=0.2.

29. Mrs. M. H., æt. 62. Simple extraction. Iris replaced with spoon. Prolapse of iris upward and outward during first night. V=0.1.

30. Mrs. E. S., æt. 78. Simple extraction. Spontaneous replacement of iris. Slight amount of cortical matter remained in the anterior chamber which underwent absorption slowly. V=0.2.

31 Mrs. F. K., æt. 62. Simple extraction. Spontaneous reduction of iris. Pupil central, round and active. V=0.4.

32. Mrs. C. C. C., æt. 62. Simple extraction. Iris replaced spontaneously. V=0.4.

In reviewing the results in these cases,which are all primary, having been made from seven to ten days after the operation, they appear satisfactory. In one there was a vision of 0.7; in two, 0.5, in four, 0.4; in two, 0.3; in eight, 0.2; in twelve, 0.1; in two, $^{1}/_{xx}$ and in one a total loss. The latter case did well for eight days without the slightest evidence of reaction; in the night he struck his eye with his hand, and the next morning the eye was tender, and very soon a violent panophthalmitis

set in. Such a loss should not fairly be counted, as it was not dependent upon the operation or the operator.

In one case there was a traumatic prolapse of the iris caused by a son of the patient's fainting and falling on him and rupturing the wound. In two cases the prolapsed iris had to be excised.

In three cases there was a small cystoid cicatrix but vision was not materially impaired thereby. In one case there was a nebulous condition of the cornea from old granular lids which interfered very much with vision. The pupil was central, round and active.

In nearly all the cases, although the notes do not show it, the pupil was round, central and active. In some there were one or more adhesions to the capsule. but not sufficient to alter the shape of the pupil. I have no doubt but that the ultimate vision in these cases could be very much increased by secondary operations.

The strictest antiseptic precautions were carried out in all of these operations. The antiseptic fluid used was that of Panas, which is hydrarg. biniodide one part, alcohol 500 parts and water 20,000 parts. In the first place the patient's face is washed with this solution and the conjunctival sac flushed with it; the instruments are laid in a bath of the same, and the operator's hands and those of his assistant are washed with it also.

The better plan to pursue in the operation if you have an assistant who can be depended upon, is to dispense with the use of the speculum entirely. Let the assistant open the lids while the corneal incision is being made, cocaine having been instilled about five minutes before the operation; after the corneal incision the cystitome is introduced and the lens capsule freely opened. This is one of the difficult steps of the operation, as the lens sometimes comes forward making it difficult to pass the cystitome over the iris. It is well to pass the cystitome pretty far down so as to insure a free incision through the capsule; as it is drawn up the upper portion of the capsule should be freely opened, then the lids are allowed to close.

The next step is the expulsion of the lens; the patient is di-

rected to turn his eye downward and then with the point of the finger, which I prefer, or with the spoon pressed against the lower lid pressure is made from below upward, and in a short time the edge of the lens pushes the iris forwards through the incision, and finally the lens presents and is very soon expelled. If any soft cortex remains it is better to remove it at once by a slight manœuvre before the iris recedes into the incision.

If the iris does not retract spontaneously, it is very easily replaced with a spatula, or with a spoon.

Then a drop of eserine is instilled. I then wet a small piece of cotton in the antiseptic and place it over the closed lids, and keep it in place by a small piece of isinglass plaster half an inch wide, which extends from the forehead down to the cheek. I always close both eyes in a similar manner for a day or two after the operation. No bandage is applied and the patient is then left perfectly free to move his head as he will. I have found that dispensing with bandages has added to the comfort of the patient, and not a little to the success of the operations. The advantages of this method are that it can be inspected without any inconvenience to the patient; by simply detaching the plaster below, the compress of cotton can be lifted and the appearance of the lids examined. If there is no puffiness of the lids and no secretion, I generally do not inspect the eye for two or three days; at the end of that time it is well to examine the eye and if the wound is thoroughly closed, there will be little or no occasion for the use of atropine, but if the iris should show any tendency to reaction, a drop of atropine can now be used. There is often a tendency to iritis the second or third day after the operation, but this can readily be controlled with atropine. If the iris should prolapse and become the source of much irritation, it is better to excise it at once. But in other cases the prolapse gives rise to very little disturbance, and in such cases it is better to wait hoping that the process of cicatrization will render the operation unnecessary.

Dr. Knapp says: "If I review my cases the opinion is

forced upon me that the simple extraction is not only the best, but the safest method of removing cataract. The iris, spread out as a *velum interpositum* between the corneal section and ciliary body, protects this, the most susceptible part of the eye, from the deleterious substances that may enter through the wound."

Another consideration, in my judgement, is that if any soft cortical substance should remain, it would cause less harm behind the iris than it would in a case where an iridectomy had been made, and where the swelling lens substance could come directly in contact with the corneal incision. The trauma inflicted upon the iris by the expulsion of the lens in a smooth, uncomplicated simple extraction, is certainly less than in Graefe's extraction with iridectomy.

With a liberal corneal incision the lens comes out with surprising ease, and ordinarily the iris replaces itself spontaneously. When it does not, it is easily replaced with a spatula or with the edge of the spoon. The latter has the advantage in that it is somewhat wedge-shaped, and when introduced into the lips of the wound opens them more widely, and thus favors the prompt reduction of the prolapse. After the escape of the lens and while the iris is still out of the incision, it is better to remove all the soft cortex if possible. The slide manœuvre should be continued until every piece is out.

If the iris is allowed to go back into position, it is more difficult to cause its prolapse, as it no longer has the mass of the lens to force it out.

In one of my cases there was a slight rent of the pupillary edge of the iris, but it caused no trouble.

ON CYCLOPLEGIA POST-DIPHTHERITICA.

BY DR. O. LANDMANN, TOLEDO, OHIO.

By cycloplegia is meant a paralytic or paretic state of the ciliary muscle and the consequence is a complete or incomplete abolition of the power of accommodation. Broadly considered accommodation is a faculty which enables us to change the shape of the crystalline lens so that we can obtain images upon our retinæ of near objects. It is accompanied by the phenomena of convergence and always, under normal conditions, by contraction of the pupils. During its performance the zonula of Zinn (or suspensory ligament) is relaxed through contraction of the muscle and the anterior and posterior convexities of the lens are increased, the former more than the latter. Anything which abolishes or interferes with this function renders unaided vision, for near objects, indistinct.

The purpose of this paper will be to dwell mainly upon cycloplegia following *diphtheritis faucium* and *nasalis*.

Paralysis means to me abolition of motority, sensation or loss of function ; it is a symptom.

I will attempt to explain my conception of the first: "motority."

No investigator has shown the existence of the development of nervous elements in that undifferentiated mass of protoplasm, called amœba, the study of which discloses that the undifferentiated protoplasm displays certain vital fundamental phenomena.

1. It is receptive and assimilative.
2. It is metabolic and secretory.
3. It is respiratory.
4. It is irritable and automatic.
5. It is reproductive.
6. It is contractile.

This latter property differs from that of the muscles in the fact that in the amœba the flow of protoplasm is irregular, in the other regular.

This property of motority obtains independent of nervous elements.

Bernard through the means of Curara demonstrated the existence of contractibility as an independent quality of muscular tissue. Curara by poisoning the nerve end organs permitted, by isolating each organ, the study of each.

I can conceive of a peripheral paralysis being due to an abnormal condition of the muscle or nerve. A muscle can be paralyzed; the nerve may be intact in structure and function and still some abnormal state of the muscle annul its function. For examples:

A fatty degeneration or neoplasm preventing contraction, the nerve being unaltered; or a trauma placing a muscle in a state of noncontractibility; cysticercus in a muscle; atrophy; malnutrition, etc. The third cranial nerve takes its origin in the grey matter of the floor of the aquæduct of Sylvius in the region of the superior corpora quadrigemina. It arises from several nuclei, the most anterior controls the ciliary muscle, the one for the sphincter of the pupil is next, than come the nuclei of the origin of the remainder of the third, and the nucleus of the internal rectus comes last.

Recent observations would indicate a close connection between the third and sixth; fibres from the latter passing to the external rectus and a bundle crossing over and joining the third without passing through any of its nuclei. Moreover, I am inclined to the belief that there are fibres from the third going the sixth, having seen a case of paresis of all the muscles in the right eye supplied by the third, with paresis of the external rectus of the L. E. Still this is only a clinical observation.

This facilitates conjugate sinistral and dextral movements. It supplies all muscles except the superior oblique and the external rectus. The third arising from several nuclei and supplying muscles which, in some instances, are opposed to

one another must be regarded as a mixed rather than a single nerve.

The nucleus of the fourth lies directly below that of the third.

The causes of cycloplegia will be divided into nervous and muscular on account of the conception as previously advanced of the paralytic or paretic state.

Nervous.—In general anything that may induce paresis or paralysis of the third in any part of it. Lead poisoning, poisoning from meats, after trigeminus neuralgia, syphilis, rheumatism, diabetes mellitus, herpes zoster ophthalmicus, acute gastritis, trauma, sometimes in sympathetic ophthalmia, gummata, exostoses, tumors, neuritis, hæmorrhages in the brain subsubstance or at the base of the cranium, tabes dorsalis, multiple sclerosis, uterine troubles, and finally anything which may affect the local nervous mechanism.

Muscular.—Atrophy, fatty degeneration, waxy degeneration, malnutrition, anæmia, febrile states as typhus, plastic inflammation, tumors and glaucoma.

I think also a condition of the percipient elements of the eye can be such that the impressions made upon them may be insufficient to evoke the mental state proper to induce a contraction of the ciliary muscle as chorio-retinitis centralis with cycloplegia, glaucoma, etc.

There may be cycloplegia alone or cycloplegia with dilatation of the pupil, called also ophthalmoplegia interna. The peculiarity of ocular paralysis or paresis following diphtheria is ciliary paralysis or paresis with almost intact reaction of pupil. In some of the cases which have fallen under my observation there was a slight dilatation. The resultant phenomena are, loss of accommodation, strabismus convergens concomitans, and occasionally micropsia, *i. e.*, objects which with complete strain of accommodation can still be clearly seen, appear diminished in size, because our judgement of the sizes of objects depends not only upon the size of the retinal image but also upon the distance into which we project the image. Our judgment of the distance of the object depends in the greater degree upon the convergence of the visual axis and upon the accommodative effort.

Paralysis of the muscles of the pharynx and soft palate will generally be associated with this paralysis. The uvula and epiglottis stand obliquely, the uvula remains (alone) more or less motionless, during the phonation the vocal chords meet imperfectly because of the retarded movement of one of the processus vocales. According to Pagenstecher the paralysis is confined to one-half of the throat. I looked for anæsthesia but found it absent. The relaxed state of the muscles at the entrance of the pharynx causes gutteral respiration, difficulty in swallowing, regurgitation of food through the nose, nasal twang of voice.

(These paralyses come on as sequelæ 2 to 6 weeks after subsidence of the inflammatory symptoms. Prognosis favorable. Recovery minimum ten days).

Morbid Anatomy relating to the paralysis. A careful examination of the nervous centers, made in certain fatal cases, has revealed nothing which throws light on its ætiology (Smith) and the most recent hypothesis is that peripheral changes in the nerves are the cause. In other examinations there were found: Extensive changes in the cord and its membranes, hæmorrhages around the roots of nerves, proliferation of nuclei in the grey matter, hæmorrhages, inflammation and degeneration in the peripheral and central nervous system; muscular changes, atrophic, fatty, and waxy degeneration (a form of coagulative necrosis, i. e. the contractile myosin coagulates into a lustrous homogenous mass). There is, evidently, a lack of harmony in the results of examinations.

Dec. 12, '89. S. J., æt. F. History: Had had diphtheria nasalis. Duration, about 22 days. Presented himself for examination two weeks after the subsidence of the inflammation.

Status præsens. Anæmic, nasal speech, wandering pains, regurgitation of solids and liquids when eating or drinking, rhinitis and pharyngitis, paresis of soft palate and pharynx.

R. E. $V={}^{6}/_{XII}$ Hm. 1.50 D. $V={}^{6}/_{VI}$. Sn. 2.25 in 40 cm.

+3 D. Sn. $^{1}/_{2}$ in 8. Pupil reaction normal.

Sn. 1 in 90 cm. Colors normal; visual field normal.

L. E. Idem.

B. E., $^6/_{VIII}$ + 3 D., Sn. $^1/_2$ in 8, F. C. P. normal.
Sn. 1 in. 1 m.

Opthal. R. E. H. 1.50 D. L. E. 2.00 D. Fundi normal.

Examination revealed incomplete loss of accommodation. Diagnosis: Cycloplegia of B. E. Examination of sister, who was now one week convalescent, showed eyes normal.

Dec. 13. Sn. 2.25 in 40. Therapy. Cocaine. Faradic current.

Dec. 14. Idem.
" 15. "
" 17 "
" 18 Sn. 1.75 in 25.
" 20 " 1.50 " " Opthal., R. E. 1.50 D. L. E. + 2.00 D.

Strabismus concomitans. Homonymous diplopia in 6 m. Movements of eye perfect.

Dec. 22 Sn. 1.25 in. 25, Therapy the same.
" 24 " 0.8 " "
" 27 " 0.5 " 30,
" 31 " $^1/_2$ in. 12 cm. Sn. 1 in 1m.

Feb. 3 " $^1/_2$ " 8 " Sn. 1 in 1m. Strabismus has disappeared on the same day.

Examination of sister: Alternating strabismus.

Homonymous diplopia in. 6 m. Movements of eye perfect in 1 m.

B. E. $<^6/_{VI}$. Hm. +1. D. S $= ^6/_{VI}$ Sn. $^1/_2$ in 40.

Strabismus after a few days was convergent, and of left eye. This disappeared spontaneously in about three weeks.

Remarks. Although there was marked paresis of the muscles of deglutition and of the pharynx, still this was not treated in order to observe the effect of faradization upon the ciliary muscle.

Method. Antiseptic precautions were observed, the hands were washed in a solution of bichloride of mercury (1-5,000), the conjunctiva was rendered anæsthetic by cocaine (2% solution). I placed one electrode upon the temple and grasping

the other in my left hand used the index finger of my right as the rheophore, passing it slowly over the ciliary region. The time employed for each eye was 5 minute. The recovery was quick compared with the pharyngeal paralysis and that of the soft palate, for these continued about three weeks after the complete recovery of the accommodation. The patients had used porter for a few days.

The strabismus follows the cycloplegia, and is a result of the hyperopia, for it disappears with the restoration of the power of accommodation. Again, the movements of the eyes were unimpaired and hence the squint, in the cases observed by me, was non-paralytic.

Conclusions. I believe that in the majority of cases, a perverted state of the blood from the disease, influencing the irritability and nutrition of the *muscle*, and not of the *nerve centres* or *nerve endings* is the cause of cycloplegia sine iridoplegia. I have seen a case of anæmia in which there was marked paresis of accommodation alone, so that the patient who was a young woman, æt. 19, read only Sn. 2.25, B.E. em—metropic. Fundi anæmic. Pupils, convergence, color-sense, and fields of vision normal. Menstruation regular, but dysmenorrhagic. Recovered after three months of a course of tonic treatment. This case is mentioned merely to strengthen my position.

The faradic current was used to restore the nutrition and irritability of the muscle.

In 80% of the cases seen by me there were cycloplegia and strabismus convergens concomitans. That out of ten cases there was twice diphtheritic conjunctivitis, and in one of these, a child of 19 months, dacryo-cystitis and paralysis of the orbicularis palpebræ of the same eye.

Some objections to other hypotheses. One authority states that the different nuclei receive their blood supply from different sources, and hence the fact that we may have cycloplegia with or without iridoplegia. The inosculation is so perfect in the brain (the gray matter of the aqueduct of Sylvius is characterized by the large number of vessels) and the location of the nuclei so close

that if one would suffer the others would almost necessarily, and we would get all of the results of oculomotor—paralysis, ptosis, mydriasis, etc. If hæmorrhages into or around the nuclei formed the primary cause, the others would suffer. That inflammation of the terminations of the nerves causes the pareses may be the case in the pharyngeal and palatal muscles on account of the direct inroad of the disease on these parts No such changes have been demonstrated in the terminations of the 3d nerve in the involuntary muscle fibres of the ciliary muscle.

I think, however, in some cases we may look for a central cause.

Hence, in conclusion, I would recommend the *direct conjunctival method* in various cases, viz., In ocular paralyses, internal or external; in anæsthesia of the retina; in atrophy; in chorioditis; opacities of the vitreous; in asthenopia, retinal or other varieties; in retinitis pigmentosa; after tenotomies in conjunction with exercises with the types of Snellen or Jaeger.

The current used must be governed by the object to be accomplished. Thus we can get an indirect electrolytic action by the galvanic current to promote absorption of exudates, etc., by the Faradic current, stimulating and tonic effect.

The electrodes may be of metal and the most desirable forms are either olive or a spatula-shaped curved on the flat to correspond to the convexity of the eye-ball; or the finger may be employed. If necessary, a spring-stop speculum may be inserted, and then, by moving the eye, its various quadrants can be treated.

The plan proposed in ophthalmic works for the application of electricity is to place one electrode on the closed eye-lid. In this way the current has to traverse the orbicularis palpebræ, and hence I consider that the therapeutic effect is very much diminished. Its field, too, as a remedial agent can be enlarged.

OPHTHALMOLOGY IN PARIS.

BY ERNEST HART.

Clinic of Professor Panas: De Wecker's Operation for Ablation of the Lachrymal Gland: Capsular Advancement: Equatorial Puncture of the Sclerotic: Clinic of the Quinze-Vingts: M. Landolt's Clinic: Muscular Advancement in Treatment of Strabismus: Defective Motility: Operative and Didactic Courses.

Paris now presents at least as many advantages for the study of ophthalmology as the other great cities of Europe. The "official teaching"—that is to say, that which is given in the general hospitals of Paris and under the auspices of the Faculty—is of recent date, at least as a special branch of instruction. Formerly diseases of the eyes were treated as part of the general domain of the surgery of the wards, with results which were admittedly unsatisfactory, and which I do not hesitate to describe as deplorable.

The Chair of Ophthalmology of the Faculty of Medicine was founded ten years ago (1879). It is occupied by M. Panas, and is installed at the Hotel Dieu. It includes the titular professor, a *chef de clinique* and his assistant or sub-chief, three house-surgeons and six dressers elected by examination; a chief of the special laboratory, and, this year, an assistant professor have been attached to the clinic. The clinical service includes forty beds for males and twenty-four for females, of which four are nursery beds for the use of newborn and very young infants. There is "a laboratory of histology, bacteriology and physiology," and a daily out-patient department. Every Wednesday there is a lesson in ophthalmoscopy for the students; twice a week (Monday and Friday) clinical lectures

and operations on the in-patients by the professor; during the winter session, practical courses on refraction by the *chef de clinique;* during the summer session, conferences on the histology of the eye, normal and pathological (with illustrative lantern slides), by the *chef de laboratoire;* and further, a course of operative exercises. The latter course, which has hitherto been carried on by the titular professor, will henceforth fall to the assistant professor, who will hold office for nine years. The results of the work of the clinic and the laboratories appear in the *Archives of Ophthalmology*, founded by Panas and Landolt, and still continued, with the collaboration of Gayet of Lyons and Bardal of Bordeaux.

By the side of the clinics maintained by the state there exist private clinics, which have had and have great influence on teaching and progress. The most celebrated in earlier days were those of Desmarres, Sichel and Liebreich, which were the *rendezvous* of European ophthalmologists, where all of us have found something to learn, and where von Graefe and Horner did not disdain to come for instruction. There are many of them at present; especially should be mentioned those of de Wecker, Landolt, Meyer, Galezowski—all of them competent and accomplished men. De Wecker and Landolt take the lead by their scientific reputation and the originality of their work.

The clinic of M. de Wecker is one of the most important in Paris. About 6,000 new patients are treated annually. These afford abundant material for the delivery of courses of lectures which are very interesting, and are followed by a considerable number of students and physicians of all countries. The clinical lectures, which are followed by the most various operations, are given at 3 o'clock on Monday, Wednesday and Friday. Among these operations are some which are especially attractive to visitors, by reason of their novelty. Such is the operation for capsular advancement, which, in the opinion of M. de Wecker, is destined to replace muscular advancement in the majority of cases. It must, indeed, be acknowledged that the result is absolutely identical; the capsule is detached above

and below the muscle which is to be advanced, and the sutures, while producing a fold of the tendon of the muscle, produce, when they are fastened, a forward traction of the muscle, such as would have been obtained by detachment of the insertion of the tendon. In fact, capsular advancement is nothing less than muscular advancement without section of the tendon, which so far simplifies the operation, and renders it notably less laborious. Another quite recent operation consists in ablation of the lachrymal gland, with the object of arresting lachrymation when the cure has not been obtained by the classic treatment with bougies. The excision of this palpebral portion of the lachrymal gland is very simple as an operation, and it is sufficient to lessen the lachrymal secretion to a very great extent. It therefore affords a valuable resource in the treatment of rebellious cases which have often been the despair of ophthalmologists, and which weary the patience of the sufferer. Another interesting series of operations are those of equatorial puncture of the sclerotic, for glaucoma in those cases in which the operations habitually practised on the anterior chamber—sclerotomy and iridectomy—have not given the expected results. This, however, is a very old procedure in this country, and was a favorite one with Zachariah Lawrence. Among the most noteworthy publications of the clinic of the Rue du Cherche Midi must be mentioned the *Traite Complet des Maladies des Yeux.*

The ophthalmological clinic of the Quinze-Vingts, another ophthalmological institution which deserves a visit, was founded in 1881 by M. Fieuzal, and in 1886 M. Trousseau was also appointed. On the death of its founder in July, 1888, it was reorganized, and it includes now two distinct services entrusted to MM. Abadie and Trousseau, who give alternately consultations on ocular diseases three days a week. The other three days are given up to operations arising out of the consultations. Each service includes thirty-three beds, and, besides the *chef de service*, there is an assistant physician, M. Valude, with M. Abadie, and M. Chevallereau with M. Trousseau, and two house-surgeons who undertake the preliminary

examination of the patients and their subsequent care. Besides the operations and consultations, the surgeons attached to this clinic give every day conferences and clinical lectures, which are attended by a considerable number of French physicians and students as well as visitors. The house-surgeons also give technical explanations in various subjects of ophthalmology. To the clinic is attached a histological laboratory for the study of the specimens proceeding not only from the operations, but also from *post-mortem* examinations practised on the patients of the blind asylum of the Quinze-Vingts. This laboratory possesses at present about 2,000 specimens which have been and are capable of being utilised, from the point of view of scientific research; it is open to foreign students. It comprises, further, two rooms reserved, one for the museum containing microscopical and other preparations relating to the pathology of the eye; and the other, a laboratory of bacteriology founded last year, in which already some useful researches have been carried out. Seventy-three thousand patients have been treated at this clinic since its foundation in 1881, and its statistics indicate its value and extent. In 1887, 1,800 operations were practised here, 518 of which were for cataract, and 48,000 consultations were given. This year the number of consultations has risen to 53,600, which included 2,167 operations, among which were 622 for cataract.

The clinic of Dr. Landolt, situated at 27, Rue St. André des Arts, is frequented daily by from 60 to 100 patients. M. Landolt, assisted by two surgeons, attends there very regularly every day from noon till 2 o'clock. He operates twice a week, Wednesday and Saturday, and the operations are followed by conferences and demonstrations intended for practitioners and students. These lectures deal with the most varied subjects, the clinical and practical point of view predominating; and the presentation of interesting cases serves always to afford information such as theoretical lectures alone are often incapable of giving. The different territories of ophthalmology are successfully explored in this way, and there is a considerable collection of microscopic preparations which M. Landolt places

at the disposal of his pupils, in support and explanation of the demonstrations. One of the domains of ophthalmology which he has especially explored is that of the movements of the eye, studied from the physiological as well as from the pathological point of view. The importance and originality of the views of M. Landolt in all that concerns strabismus are well known. The etiology of that affection, the conditions which preside over its evolution and the means of curing it are very carefully studied. Each patient suffering from any defect whatever of the motility of the eye, is subject to complete examination, not only with reference to refraction and visual perception and the degree of strabismus, but also to the relative strength of each muscle and the degree of binocular vision. Ingenious methods and special apparatus are employed for illustrating these different points. I would especially draw attention to the methods employed in determining the fields of fixation or excursion of the eyes, so important from the point of view of prognosis and of operative indication. In relation to the treatment of strabismus and the muscular affections, Dr. Landolt combines the muscular orthoptic cure (stereoscopic apparatus of Hering) with the surgical cure. His researches on the relative force of muscles by means of the field of fixation have led him to prefer muscular advancement to tenotomy; he was one of the first and warmest supporters of this operation —more difficult, indeed, but more sure and now more generally approved.

The arguments which weigh in favor of muscular advancement were very clearly put forward by M. Landolt lately at the International Congress of Ophthalmologists of Heidelberg.

M. Landolt also affords at his clinic opportunities for studying the subject of insufficiency of convergence and defective motility, which the author considers as a first step toward a latent divergent strabismus. He has applied himself to the surgical cure of this affection, for which he recommends muscular advancement of the internal rectus in preference to tenotomy or setting back of the external rectus.

Together with numerous operations of strabismus, of cata-

ract, glaucoma, etc., M. Landolt practises a considerable number of operations on the eyelids. The surgical cure of trichiasis, of ectropion and entropion, has been modified by him in an original fashion. For ectropion and implantation of the eyelashes he has recently employed a sufficiently simple and efficacious procedure, which consists in the formation of two triangular flaps in the direction parallel to the free border of the eyelid. The one includes the eyelid which is to be set straight; the other, of the same form and dimensions, is formed only by the skin of the eyelid. It suffices to slide the second flap under the first to obtain a free border deprived of lashes. Other ingenious proceedings are employed for autoplastic operations on the eyelids. Besides the methods by sliding flaps borrowed from neighboring parts, he has employed with success Reverdin's grafts, and quite lately has replaced this latter method by the skin graft of Thiersch, consisting in the implantation on a non-granular surface of a very thin flap of skin detached with a razor. In a case of exceedingly destructive epithelioma of the lower lid, flaps about 2 cm. long and 3 to 4 cm. wide were borrowed from the thigh, and were transplanted on to the site of the loss of substance. They became attached with such rapidity that eight days afterwards the extensive wound was completely covered over.

In addition to the clinical teaching, M. Landolt gives a course of operations on the subject or on the eyes of animals, and, as he speaks English fluently, English students are enabled to profit by his private operative courses given in that language.

Amongst his numerous publications may be cited those on the employment of instruments in ophthalmic surgery, which have been translated into English, such as "A New Procedure of Blepharoplastic and Optico-ciliary Section;" "Some Operations Practised on the Eyelids;" "Tenotomy of the Inferior Oblique;" etc. A considerable number of publications have been issued from this clinic during the last ten years; the most important work is the *Accommodation et Refraction*, which has

been translated into English ; an analogous work on the methods of exploration of the eye ; one on the disorders of motility, and the classical *Traite Complet d'Ophthalmologie*, of which he is joint author with De Wecker, and which is still in course of publication. His lectures on the diagnosis of diseases of the eyes, given at the Ecole Pratique, have also been translated into English. They give an excellent account of the principles which should guide the practitioner as well in the domain of refraction and optics as in that of clinical treatment.

In M. Landolt's clinic is not only produced work of pure speciality, but certain questions of general pathology are also studied there, in their relations to diseases of the eye. Thus quite lately M. Landolt published, on the occasion of the jubilee of Donders, an important study of verbal blindness, *Cecite Verbale*, in which will be found the relation of three interesting cases complicated with hemiachromatopsy.—*British Med. Journ.*

EDITORIAL NOTICES.

American Medical Association.

Section of Ophthalmology.

Chairman—George E. Frothingham, Ann Arbor, Mich.
Secretary—G. C. Savage, Nashville, Tenn.

First Day—June 25.

1. Address by the Chairman, Geo. E. Frothingham, Ann Arbor, Mich., "The Need of Discussing Ophthalmic Subjects."

2. "The Prevention of Pain and the Improvement of the Stump following Evisceration of the Eye," by A. E. Prince, Jacksonville, Ill.

3. "What can We do to Induce the Government to Make the Census of 1890 Contribute Efficiently to a Clear Concep-

tion of the Causes of Blindness in the United States," by Robert Tilley, Chicago.

4. "Advances in Our Knowledge of Some Cerebral Ocular and Intra-Ocular Lesions which Facilitate the Diagnosis and Treatment of Important Diseases," by H. W. Williams, Boston.

5. "Ocular Symptoms of Diseases and Injuries of the Spinal Cord," by J. F. Fulton, St. Paul, Minn.

6. "Impaired Vision as a Result of Sunstroke," by A. R. Baker, Cleveland, O.

7. "Some Cases of Inflammation and Atrophy of the Optic Nerve, with Special Reference to Etiology and Prognosis," by J. L. Thompson, Indianapolis, Ind.

8. "The Non-Surgical Treatment of Strabismus Convergens," by E. J. Gardiner, Chicago.

8. "Tobacco Amaurosis," by Leartus Connor, Detroit.

10. "Paralysis of Accommodation from Concussion of Eyeball; Treatment," by Eugene Smith, Detroit, Mich.

SECOND DAY—JUNE 26.

1. "A Case of Sympathetic Irido-Choroiditis, Induced by Sarcoma of the Choroid, and Appearing Five Days After the Enucleation of the Sarcomatous Eye; Interesting Clinical History and Final Recovery," by F. C. Hotz, Chicago.

2. "Tumors of the Optic Nerve," by S. C. Ayres, Cincinnati.

3. "The Needless and Annoying Restraints after Eye Operations," by J. J. Chisolm, Baltimore.

4. "The Advantages of a Preliminary Iridectomy in Cataract Extraction," by LeRoy Dibble, Kansas City.

5. "Keratitis Trachomatosa," by J. H. Thompson, Kansas City.

6. "Gradation of Lenses," by Dudley S. Reynolds, Louisville.

7. "Glaucoma Fulminans, after Operations," by P. D. Keyser, Philadelphia.

THIRD DAY—JUNE 27.

1. "Traumatism of the Eye," by C. M. Hobby, Iowa City

2. "Ametropia in Schools," by F. B. Tiffany, Kansas City.

3. "The Ametropiæ and Their Relation to Insufficiencies of the Recti Muscles," by J. W. Wright, Columbus, O.

4. "Embolus of the Inferior Branch of the Retinal Artery Visible with the Ophthalmoscope, Disappearance of Embolus and Recovery of the Greater Part of Visual Field under Massage and Nitrite of Amyl," by H. Gifford, Omaha, Neb.

5. "Intra-Ocular Diseases Caused by Chronic Rhinitis," by J. G. Sinclair, Nashville, Tenn.

Other papers have been promised, but as yet the subjects have not been announced. All who expect to read papers are requested to send the title at once, either to the Chairman or Secretary of the Section, otherwise they cannot be placed upon the programme of proceedings, which will be published soon by the Committee of Arrangements.

American Ophthalmological Society.

43 Pratt Street,
Hartford, May 30, 1889.

The Twenty-fifth Annual Meeting of the American Ophthalmological Society will be held this year on Wednesday and Thursday, the 17th and 18th of July, at the Pequot House, New London. New London may be reached from New York by trains leaving the Grand Central Depot, or by the Norwich Boat from Pier 40; from Boston by the Shore Line, or the N. Y. and N. E. The rates at the Pequot House are $3.00 per day, for members of the society and their families.

With the view of securing an interesting discussion of papers presented at the meeting, the secretary has been requested to ascertain the titles of all papers which may be offered; these titles will be incorporated in the formal call for the meeting, and will take precedence on the bulletin over all other papers.

In order that suitable accommodations may be secured for all members of the society, please notify the secretary

before July 1, whether or not it is your intention to be present at the meeting, and if you will be accompanied by any member of your family.

S. B. St. John, Secretary.

Department of the Interior, Census Office,
Washington, D. C., May 1, 1889.

To the Editor: The publication in your valuable paper of the accompanying letter to the medical profession will aid the Census Office in one of its most important and difficult investigations. If you should think the matter of sufficient importance to notice it editorially, it will be appreciated, as it is necessary to obtain the co-operation of medical men in all parts of the country to insure a successful result. This is all volunteer work on the part of the physician, and any assistance you may feel inclined to give will materially help a most important branch of statistical inquiry.

It is equally important to the country that the returns in relation to farm products and live stock should be full and correct. The enumerator in the house to house visit he will make during the month of June, 1890, is constantly met with the fact that farmers keep no books and hence returns are not infrequently guess work. The census year begins June 1, next, and ends May 31, 1890. If farmers throughout the country would note this fact and keep account of the products of their farms during the census year it would be of material aid in securing reliable returns for the Eleventh Census.

Robert G. Porter,
Superintendent of Census.

Department of the Interior, Census Office,
Washington, D. C., May 1, 1889.

To The Medical Profession: The various medical associations and the medical profession will be glad to learn that Dr. John S. Billings, Surgeon U. S. Army, has consented to

take charge of the Report on the Mortality and Vital Statistics of the United States as returned by the Eleventh Census.

As the United States has no system of registration of vital statistics, such as is relied upon by other civilized nations for the purpose of ascertaining the actual movement of population, our census affords the only opportunity of obtaining near an approximate estimate of the birth and death rates of much the larger part of the country, which is entirely unprovided with any satisfactory system of state and municipal registration.

In view of this, the Census Office, during the month of May this year, will issue to the medical profession throughout the country "Physician's Registers" for the purpose of obtaining more accurate returns of death than it is possible for the enumerators to make. It is earnestly hoped that physicians in every part of the country will co-operate with the Census Office in this important work. The record should be kept from June 1, 1889 to May 31, 1890. Nearly 26,000 of these registration books were filled up and returned to the office in 1880, and nearly all of them used for statistical purposes. It is hoped that double this number will be obtained for the Eleventh Census.

Physicians not receiving Registers can obtain them by sending their names and addresses to the Census Office, and, with the Register, an official envelope which requires no stamp. will be provided for their return to Washington.

If all medical and surgical practitioners throughout the country will lend their aid, the mortality and vital statistics of the Eleventh Census will be more comprehensive and complete than they have even been. Fvery physician should take a personal pride in having this report as full and accurate as it is possible to make it.

It is hereby promised that all information obtained through this source shall be held strictly confidential.

Robert G. Porter,
Superintendent of Census.

F. C. DONDERS, †.

The sad news of the demise of the great physiologist and ophthalmologist, DONDERS, has shocked the whole of the literary world and the many personal friends of the departed, and has brought the deepest mourning to his nearest relatives.

The following lines are not written to express this sorrow in words—every attempt in this direction would be futile and useless; neither is it their aim to depict in an exhaustive manner the scientific value or the literary and didactic work of the great scientist—this would call for a more knowing pen than the one at the writer's disposal; they want simply to describe the exterior of the life of the dear departed in a few words; they want to be taken as a memorial of his now completed earthly career.

F. C. Donders was born May 27th, 1818, at Tilburg, in Holland. He was the son of a merchant who died a year later, 64 years old. Of his nine children F. C. Donders was the only boy.

His mother conducted his first education up to his seventh year. She then sent him to the grammar school at Duizel, in which the teaching was but very moderate. From his 13th to his 17th year Donders visited the Latin school at Boxmeer, where, according to his mother's wish, he was to be educated as a minister. Here, too, except in Latin, the teaching was very inferior, especially in mathematics and Greek, and, moreover, the mind of the growing youth developed in a manner which did not conform to the wishes of the mother. Donders tended much more toward the study of natural science than that of theology. He turned towards medicine, and began his medical studies in the military medical department of the University of Utrecht, in the year 1835, and graduated in 1840 at the

University of Leyden. After the conclusion of his studies he was first employed as military surgeon at Vliessingen, and then at the Haag. In 1842 he was ordered to the military school at Utrecht in the capacity of a teacher of anatomy and physiology, and in 1847 he was made professor in the medical faculty, although Schroeder van der Kolk still taught anatomy and held this chair until his death (1863). Meanwhile Donders arranged a physiological laboratory in a few rooms and taught general physiology and histology, and later on general pathology, forensic medicine and ophthalmology. He was often consulted by practitioners who paid especial attention to eye-affections concerning points in physiological optics, and he, himself, on the other hand, became interested in the pathological changes of the human eye, as throwing some light on the physiology of the healthy eye. Thus more and more, and almost against his will, he was led into the practice of ophthalmology.

This tendency towards practical ophthalmology, not premeditated at first, brought him to London at the occasion of the first great exposition in 1851, and into the house of the great London oculist, Sir William Bowman, and it was then and there that he met for the first time with A. von Graefe.

From the preface and dedication of his work on astigmatism and cylindrical lenses, (1862), as well as from Donders' oration, occasioned by the first awarding of the Graefe medal at Heidelberg in 1886, and held in memory of von Graefe, it is best seen how intimate was the bond of friendship which had sprung from that first meeting. In 1888 Donders said at a public occasion: "I believe I never loved a man as I loved A. von Graefe."

The first scientific discussion of these two men, who later in life became so intimate, at the hospitable board of Sir William Bowman, concerned a question which both of them—Donders as well as Graefe—had studied and about which—and this must have heightened the charm of the discussion most—they had come to results diametrically opposite.

Donders had put Hueck's opinion (that the oblique muscles

roll the eye around the optical axis) to a closer test and had found that the argument of Hueck was fallacious (observation of the movements of the experimentor's eyes in a stationary mirror). Donders stated that if a mirror is fastened to the observer's head, and parallel with his face, in such a manner that when the head is bent towards the shoulder this parallelism must remain unchanged, no rolling movements of the eyes can be observed in the mirror.

A. von Graefe, on the other hand, had made experiments, especially on rabbits and fish (animals with laterally situated visual organs). In these experiments the animals were fastened on their sides on a board which then was turned around an axis vertical to the plane of the board. During this manoeuvre strange rolling movements of the eyes were observed which suddenly were reversed in their direction as soon as the angle of rotation had reached a certain degree.

The matured results of these then unfinished experiments were three years later published as A. von Graefe's first paper in the first volume of the Archives of Ophthalmology founded by him.

In 1858 Donders founded with funds voluntarily contributed by the Hollandish people the "Nederlandsch Gasthuis for Ooglijders" (Eye Hospital of the Netherlands).

We give here a part from Moleschott's festival greeting for May 27th, 1888, as characterising best this institution which has now a world-wide renown.

"What,however,is the value of all our knowledge, what good is all our science, if we do not make use of it in charitable work?

"The answer to this question is given in the hospital for indigent sufferers from eye diseases of the Netherlands, and its founder was Donders.

" We really do not know what to praise highest in this wonderful institution, science or charity.

"Since no building could be found which might have been used for a hospital for eye-patients, the idea arose in Donders' mind to apply to the charity of the people of the Netherlands.

His wishes were met on all sides. Never had he to complain of opposition. The best and most esteemed personalities aided by means of their influence and their favor. In but a few months the erection of the hospital for eye-patients of the Netherlauds was secured. From its beginning this institution could rival the best which then existed in Europe. It first aim was to charitably help the poor sufferers from eye-diseases. Yet, at the same time the institution was made use of for the teaching of ophthalmology and the education of future ophthalmologists.

"Teaching, when in the hands of a man like Donders, means science, scientific investigation. The institution has at its disposal all the apparatus which will show the laws of light, the functions of the eye, in the healthy or diseased state. There is an anatomical museum which comprises the human, comparative and pathological anatomy of the eye and its appendages, a collection of microscopical specimens, as well as all the instruments necessary for operations on the eye, and finally a library to which all civilized countries are contributors.

"Eye-patients from all parts of the Netherlands and from other countries seek and have sought help at this hospital in large numbers; and the concourse of pupils was so great, that we can say of Holland with a better right than of any other country, that there is almost no city or town which could not boast of a well-educated ophthalmologist."

The erection and inauguration of the physiological laboratory of Donders happened in 1866 and 1867. This was the real workshop for his scientific work and teaching. Here he was active until the summer of 1888, when he completed his seventieth year, and had—according to the laws of Holland—to give up his official position as teacher.

The seventieth anniversary of his birthday was a memorable festival.

Whoever has seen him on that day—and the number of those who from near and far came on this day to see him and to pay him their homage—must have felt enraged at the hardness and injustice of laws which remove a man from his teach-

ing position, who like Donders matured in a long and active life, and vigorous in body and mind like a youth, stood in the presence of an endless number of congratulants.

But fate had decreed differently with regard to him! During August of the same year Donders still presided over the International Congress of Ophthalmologists almost without interruption from beginning to end, with unchanged vigor and with his peculiar agility of mind, yet, only a few months later the angel of death began the work of destruction.

While on a trip to London, on which he went soon after with his young wife, he suddenly lost the faculty of speach and his memory also began to give out. His friends hoped for improvement and recovery—but in vain! Although small changes towards the better aroused from time to time new hopes, it was soon no longer doubtful that this condition would slowly and continuously lead to death. His consciousness grew dim and was altogether lost during the last weeks of his life. Quietly and easily the end came on the 24th of March, of this year.

He left behind him to mourn his loss as his nearest of kin, two children of his only daughter from his first wife who had departed long before him, and his second wife who was vouchsafed a very short time only of a happy union with him.

(Zehender's Mtsbl.)

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COLOR PERCEPTION.

BY H. V. WUERDEMANN, M. D., WASHINGTON, D. C.

Read before the Philosophical Society of Washington, March 2, 1889.

That most of the theories of color perception extant are, in the light of present scientific knowledge, illogical and absurd is quite evident to even the casual observer.

In order to arrive at a fair and intelligent conclusion it is necessary that the main principles of the more important theories should be analyzed and compared.

The first scientific theory of light was brought forward by Sir Isaac Newton, in 1668, and is called the corpuscular theory. This, I presume, is familiar to all of us. The theory of color perception advanced by Newton and his followers is simple, and if the main hypothesis were correct would be entirely satisfactory. It is condensed in the following paragraph from a book published in 1759 by that distinguished physiologist, Dr. Wm. Potterfield, of Edinburgh:

"§ 5. The third manner in which colors may be considered is the passion of our organ of sight, that is, the motions or vibrations excited in the fibres of the retina by the impulse

or stroke received from the rays of light; which motions or vibrations being propagated along the solid fibres of the optic nerves into the brain, cause the sensation of colors. For the rays of light being corpuscles of different magnitudes, will, by striking the retina, excite vibrations of different bignesses, which, according to their bignesses, must excite sensations of several colors much after the manner of the vibrations of air, according to their several bignesses excite sensations of several sounds; and particularly the shortest or most refrangible rays will excite the shortest and weakest vibrations for making a sensation of deep violet, the largest or least refrangible, the largest and strongest vibrations for making the sensation of deep red, and the several intermediate sorts of rays, vibrations of several intermediate bignesses to make sensations of the several intermediate prismatic colors; but when the several heterogeneal rays are blended together promiscuously, they must, then, in falling upon the *retina*, excite several other different sorts of vibrations for making the sensations of the several cempound colors, which will, therefore, differ among themselves according as the light is composed of more or fewer of the different colored rays, or as they are mixed in various proportions."

The corpuscular theory of light has been disproved in many ways. The undulatory theory, now generally held, originated with Huyghens in 1678. All theories of color perception to be acceptable must rest upon his theory until that is disproved. The one most generally accepted was that evolved by Thos. Young in 1802. Helmholtz has ably seconded this in our generation. Backed by these great names the world has tacitly accepted their opinion as the ultimatum.

Observers have imagined, from the complexity of the retinal mechanism, tnat each layer must have a special perception of its own. Some have even gone so far as to name these characteristics. They overlook the fact that the eye is simply an optical instrument, each part being essential to the function of every other, and perfect action being impossible without existence of all the structures.

It does not matter for any theory which is called the percipient layer, provided that each elementary portion of the retina is connected with the brain centres by one or more nerve fibres. Thos. Young advocates three of these elementary portions adapted to the reception of three sensations of color, which he considered to be primary. One set of sensations, strongly acted upon by the waves of light due to long intervals, producing a sensation we call red, another set responding most powerfully to those of medium length, generating green, and a third most strongly stimulated by short rays, producing the impression of violet. The red of the spectrum acts most powerfully on the first set, and according to Young, acts also upon the other two sets of nerves, but with less energy. [This is better understood by inspection of the accompanying diagram taken from the Physiological Optics of Helmholtz.]

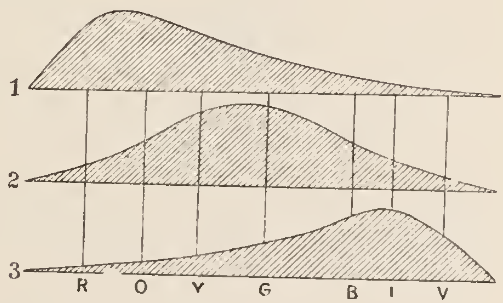

FIG. 2.

Here are placed the colors of the spectrum in order, the curves indicating the degree to which the three kinds of nerves are acted upon. We see that the nerves of the first kind are most powerfully stimulated by red light, less by yellow, and very little by violet. The next point in his theory is that when these three sets of nerves are stimulated in the same degree the sensation we call white is produced.

In 1878, Prof. Hering, of Prague (without any special endeavor to disprove the theory of Young), brought forward a proposition, which we think has less to recommend it than the

previous one. In Hering's theory we have three peculiar substances which are chemical, and not anatomical. They are designated as the white-black, the red-green and the blue-yellow. He conjectures that these substances are affected by light in a peculiar manner. The red-green substance is acted upon by no color but red and green, and these act in opposite ways. Red light, for example, acts in a decomposing or dis-assimilating manner ("D") and produces a sensation of red.

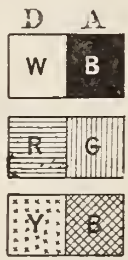

FIG. 3.

Green light acts in a regenerating or assimilating manner ("A") causing green. Blue has an "A" action on the blue-yellow substance; yellow a "D" action (Fig. 3). He recognizes four fundamental colors instead of three, which are paired, the components of each being antagonistic. For where the "A" and "D" actions in any substance are equal, the effect is neutral—no sensation resulting. On the third substance, the black-white, white light acts in a "D" manner, while black has an "A" action. Moreover, both the other substances are affected in an "A" and "D" manner by white and black.

On December 19, 1880, a paper was read before this society, the author advancing a theory, original with him, of color perception, and endeavoring to disprove the views originally accepted. The author of this article is Dr. Swan M. Burnett, of this city. Much has since been published concerning this subject by Burnett and others, and his work has been reviewed

and criticised both in this country and in Europe, the late Giraud Teulon, of Paris, giving considerable prominence to his views in the attacks he made upon Donders' defense of the Young-Helmholtz theory. A paper embodying Burnett's views in considerable detail was published in the *American Journal of Med. Sciences* in July, 1884. Although the scientific minds of America have eagerly seized this theory as a solution of color perception, yet in Europe it has received but little support, the majority of scientists in that country preferring to rest under the shadow of Helmholtz.

In 1885, Dr. Chas. Oliver, of Philadelphia, published the results of his deductions and experiments, which he called "A Correlation Theory of Color Perception." His work displays much ingenuity, and though veiled by a mass of extraneous matter, tends to the same end as Dr. Burnett's.

Dr. L. Webster Fox and Mr. Geo. Gould in 1886 brought forward a brochure on "Heat Considered as the Retinal Intermediate of Light and Color Sensation," the main principle of which, they acknowledge, was set forth in Burnett's paper.

Deductions made from these seem to represent the subject in the following theorems:

1. *a.* The retina is simply a receiving and transmitting structure which gives up faithfully to the optic nerve the impressions made by the waves of luminiferous ether.

1. *b.* The retina is an organ, whose ultimate structure is such as to allow it to respond at one and the same time to a large number of ethereal vibrations, at least such a number as shall be represented by the clearly distinguishable colors of the spectrum.

2. *a.* These vibrations may be carried along the same nerve at one and the same time.

2. *b.* These vibrations are transmitted to the central terminus of the filament in the brain where they are fully evolved, making a change in some unknown contiguous perceptive elements which are presided over by the sensorium. They are here, by the quality and nature of the change produced, differentiated into various perceptions.

3. There are no anatomical, chemical or physical grounds for either the theory of Young or Hering.

Oliver tries to step beyond that gulf, over which the mind of man cannot pass, and attempts to explain the manner in which the impressions are appreciated. He involves his theory, and greatly lessens the value of his deductions, by endeavoring to prove the existence of an "energy equivalent" resident in the nerve tip and which, when excited, is carried almost instantaneously to the brain. Although on some points these authors differ, it matters not for the main principle so long as it is declared that perception and differentiation reside in the brain, and not in the retina. It does not seem probable that the wave motion of ether undergoes a certain change in the retinal and nerve tissue, influencing the "nervous conductibility" (*i. e.*, the mode of molecular vibration). It is believed that each impression is conveyed to the brain cells separately and distinctly. Prof. Burnett, as we see, goes back to the original views of Newton, simply adapting the undulatory theory to his hypothesis. Instead of the retina being affected by the "nature and bigness" of the light corpuscles, he conceives it to be affected by the varying number and wave lengths of the ethereal undulations.

Which of these theories shall we accept? Which is more nearly in accordance with the observed facts of present scientific knowledge in the domain of wave motion and molecular physics? We must carefully lay aside all prejudices or we may be deluded by highly colored statements into accepting that which, if looked at in the proper light, would be untenable. The Newtonian theory of light is out of the question, as it has proved to be false in many ways. Now, as we have accepted the undulatory theory, it behooves us that our deductions shall conform to those brought forward by Huyghens and his illustrious followers. But Young, Hering and the rest of them also accept the undulatory theory, therefore we must first dispose of those which conflict with nature's known laws, before any other theory is admissible. Take the Young-Helmholtz theory:

At the first step we stumble upon a great stone. Young and Helmholtz (and also Hering) make the retina not only a receiving and transmitting apparatus, but a differentiating one as well. If they believe that the brain differentiates all other impressions why should they make a special exception as regards color, and suppose that for the appreciation of this a certain part of the eye is set aside as a discriminating organ? Now, they overlook a well known physical fact: When bodies are heated the ultimate molecules of which they are composed are in a state of vibration, and if heated to the point of luminosity this vibration communicated to ether culminates with us in the sensation of light.

Burnett says: "It must be accepted as a fact, therefore, that all the vibrations found in the ether must have had their existence primarily in the molecules of the luminous body. When a body is brought to a white heat, for example, the molecules of which it is composed must make all those phases of vibrations which correspond to every color into which white light may be decomposed, and must make them at one and the same time. In no other way is it possible to explain satisfactorily and consistently the various vibrations of the ether and the manner in which they are brought about.

Now, Young must have known this, for he could hardly have supposed that there were three separate and distinct fibres in all luminous bodies giving out white light, particularly in those bodies which, so far as it is possible to ascertain, are strictly homogeneous and simple. If this is true of the originating body, why should it not be true of the body receiving and transmitting the vibrations? Why is it necessary to assume the existence of three separate fibres in the retina whose office it is to receive the vibrations, when the body giving rise to these vibrations is simple, and with its molecules so arranged that they can vibrate at one and the same time in the different phases corresponding to the different wave-lengths representing the various colors. This it seems to me, is a death-blow to the sole objection advanced against the adaptation of Newton's views to the undulatory theory."

Again, if a fibre is attuned in harmony with waves of a certain length it is physically impossible to make it vibrate to waves of other lengths. Now in the Young-Helmholtz theory, yellow has no fibre corresponding to it, being but a combination of red and green. For the perception of this color there must be a vibration of the red fibre and also of the green ; two fibres adapted to phases of vibration different from each other and from yellow. If this is not a *reductio ad absurdum*, I do not know the meaning of the term.

In cases of unilateral "color blindness," the yellow appears the same in both eyes, whereas if it were a compound color it would appear, according to the theory, as red in green blindness, and as green in red blindness. [From reports of several hundred cases we must conclude that yellow and blue blindness are unknown].

Why should we seek for round-about explanations of nature's laws ? She ever follows straight paths, though our eyes may not always discern their entrances, for they may be so blocked up by obstructive theories, that they cannot be entered until we remove the obstacles.

Oliver makes a good point when he says : "The tactile apparatus is one form of telegraphic machinery destined to receive the impressions, whilst the visual apparatus is another form of the same machinery for the receipt of the same character of impressions. Each in itself is a simple mechanism not possesing differentiating power, but merely capable of response when properly acted upon. It would be foolish to assert that there may be special divisions of the peripheral tactile nerves, especially adapted for three empirical sensory impressions, cold, warm, hot, and then to make an artificial gross division of caloric into several arbitrary parts, and say that the different varieties of results are the productions of differences in grade, and amount of action on each or all of these fibres, i. e., that the action of fixed stimuli causes additions or subtractions in unknown degrees upon the organisms of elective power. Yet, here is Young's theory applied to the sense of touch.

Then again, I say that the retina is simply a receptive screen, the flattened end of the optic nerve, having about as much to do with the reception of color as the transmitting diaphragm of the telephone has with the formation of the aërial vibrations by the receiver at the other end of the circuit. We might draw a nearer analogy in the case of the ear drum, a simple membrane, which takes up and carries to the chain of small bones an infinite number of aërial vibrations at one and the same time. It is not even admitted by our latest authorities that the organ of Corti is the final differentiating organ. Even if it were, three fibres are not called upon to vibrate for thousands of tones. By Young's theory an explanation of color blindness has been worked out in an arduous and complex manner with many exceptions. Holmgren and other followers of Young-Helmholtz claim that they are not only able to detect abnormal color perception, but to make a differential diagnosis by this theory, referring to one of the three kinds of "blindness." How does this hold in practice? We have a patient who does not distinguish the reds and greens. Now all the spaces in the spectrum occupied by the colors which the normal eye perceives should be referred, according to the theory, to the third color, i. e., violet. Does he always do this? I answer most emphatically, No! The only distinction between tints falling under the heads of the confusing colors is that of intensity. As colors of the same character differ in intensity, the mistakes arising are likely to be very numerous.

I quote the following from Burnett:

"In comparing the results of these examinations, made by men of recognized ability and capacity for the work, and conducted solely with the view of arriving at the truth, with the phenomena which the Young-Helmholtz theory demands, it will be seen at once that they are far from harmonizing. An individual who is red-blind by one method of examination is pronounced green-blind by another. There is shortening of the red end of the spectrum in the supposed green-blind. There is no gray or neutral line (*n*) in cases where it ought

to be found, and when present, is often situated where it should not be. There seems to be but seldom any loss in brilliancy of the spectrum as a whole, and the brightest part is nearly always found in the yellow, as in the normal eye, and there is no sort of regularity in the manner in which the lost colors are matched. The only two colors about which mistakes are not made are yellow and blue; all other colors are liable to confusion, and in the most unexpected and heterogeneous manner.

The failure of Hering's theory to account consistently for the phenomena of color-blindness (so-called) is equally obvious. In the ordinary form of abnormal color-perception, there is an inability to properly distinguish shades of red and green. It cannot be denied that these colors are *seen*, and that they are distinguished as *colors*, though not in the same manner as in the normal eye, but *never* as simply black or white. Moreover, when the spectrum is looked at, with few exceptions, these colors are as intense as to the normal eye. How then can Hering's theory explain the phenomena? Red and green make an impression—and an impression as strong, so far as we are capable of judging, as these colors do in a properly perceiving eye. It is impossible, therefore, to suppose that a substance capable of being acted on by red and green waves is *lacking*. It can only be supposed, under these circumstances, that in the absence of the red-green substance, the yellow-blue substance acts vicariously, and in addition to its own colors, receives also those peculiar to the red-green substance—a fact which strikes at once at the foundation of the theory, and renders it totally inefficient, not to say absurd.

It will be seen, too, that both these theories make the cause of congenital abnormal perception of colors to be resident in the retina. This arises, in part at least, from the fact that they have made the retina a differentiating instead of a receptive and conducting apparatus. Each fibre or chemical substance is supposed to answer to all the primary color vibrations, and to be more easily and readily affected by some than others, and by those, too, which do not bear any relation to each other that is required by the rules of harmony.

But little attention has been given in the discussions of color-blindness to the part played by the brain in either normal or abnormal color-perception. The fact that *we see with the mind and not with the eye*, seems to have been entirely ignored by the partisans in their zeal for one or the other theory. It has been sought to explain all the phenomena of color-perception, normal as well as abnormal, by means of a normal or abnormal state of the retina, although all must know that *no impression can be converted into a sensation except it reach the brain and be* properly acted upon by the organ which presides over the function of vision.

The last remark of Burnett's is greatly emphasized by another fact of physics concerning vision. Is not an image thrown upon the retina upside down, and do we not see things in the proper position without standing on our heads? We explain this by stating that vision is greatly an educated sense. The perception of form, color and light is not due to the eye alone; all the other senses add some mental factors. As images are not seen in the eye but are referred to a position in space, the child's brain grdually learns to associate the image of the top or bottom of an object with the impressions conveyed by its other senses.

Vision in the adult is greatly modified by illusions; the mind in many instances overrules the impressions conveyed to the brain, substituting memory. A clever draughtsman can indicate a face by a few rough touches, which will be immediately transferred in the spectator's mind to a portrait.[1] The reason for this is that his mind is so familiarized, through recurring experience, with the object, that it is ready to construct the requisite mental image at the slightest external suggestion. All optical illusions can be explained in this manner. We are comparatively inattentive to color which varies with distance, atmospheric changes and illumination. Thus the color of a field of grass, perhaps miles away, is designated green, though in reality it is grayish.

[1]This would simply remain a mass of lines to an uncivilized man who was unaccustomed to the delineation of objects.

How can we explain the effect of contrast by Young's theory? I mean contrast of areas where there is not a true mixture of colored light. Is this not best explained by saying that it is a psychic act? Hering stands upon the same ground that we do, when he agrees to the psychical nature of simultaneous contrast. The same objections may be raised to the theory of Prof. Hering, besides numerous others. The simple colors are not complementary; for instance, the complementary of "R" is not "G" but bluish-green, and there is no reason to suppose that they are antagonistic. White is not the result of subtraction but of addition, as the white formed by the addition of any colors is equal the sum of their intensities, and not the difference. White is not a direct independent sensation, but the sum of all appreciable impressions. Has any other sense been proved to be due to a chemical activity? It is true that Boll and Kühne succeeded in fixing an optogram upon the retina of a rabbit, but as the macula contains no rhodopsin (Boll's purple) it is considered that vision is not explainable by the formation of optograms on the retina. (By the way, photoprints can be taken on any structure of the human body, by direct sunlight, for instance, sunburn or tanning. The subject is exactly where it stood before the discovery of the visual purple. Many of Hering's statements were, I think, rendered impossible, long before his theory came into existence, by experiments in support of Young's theory.)

Now as to the theory of Burnett: I have already shown that the molecules of the luminous body giving white light must vibrate to as many colors as there are in white, and that it is absurd to fix a definite number (3) of bodies in the retina vibrating for more than one color at one time. Why do Young and his followers take the trouble to give a series of organic elements a coarse unnatural division of fibre, in an effort to harmonize them with an arbitrary and unscientific naming of visible colors, when the difference in result depends upon a difference in cause, acting upon an ever ready material. A difference in the character of the natural impressions affecting

one and the same element to a greater or less degree, produces an exact and equivalent answer. If a simple and homogeneous structure like the wire of a telegraphic instrument can transmit more than one message at the same time, why is it not true of each filament of the optic nerve?

We gained some points, I think, when we showed the utter want of support that the Young and Hering theories have from analogy. The phenomena of crossed associations between the senses, among those of colored audition, are undoubtedly psychic. In this there are certain notes, whose perception is associated with the sensation of certain colors. From experiments (some of which I have done myself upon musically gifted persons), there are found to be two kinds, "Photopsie," or simple luminous impressions following sonorous stimuli, and "Chromopsie" or colored visual sensations of which there are many forms. The sense of sight is assisted by the sense of hearing, for barely legible print may often be read when accompanied by a sound. Colors may be recognized at a distance where they were not before perceptible. Colors formerly not visible may be brought into the sensory field. These photisms or sound colors may be produced by experiments; in one, the subject looks at a gray disc of paper upon a white background while the sound is made. The photisms may be caused in consequence of sonorous stimulation by a singing voice only, or by ordinary speech, pronouncing the consonants or vowels, or by instrumental notes as by a tuning fork.

Conversely the sense of audition is reinforced by the sense of sight. The ticking of a watch is made more intense by the sight of blue and green, less by blue and yellow. Sound has its intensity decreased when the eyes are closed. The effect of an impression on one eye influences the sound in the ear on the same side more decidedly than in the other. Excitation of other special sense organs not only affects their own brain centers, but also transmits some vibrations to the other centres. Cases of colored smell and colored taste have been recorded. Perceptible emotions, as joy, sorrow and violent

impulses cause, in some cases, sensations of color. Conversely the sight of certain colors gives rise to peculiar sensations of smell, taste, or certain pyschical conditions. These experiments remind us of persons deaf from disease of the middle ear, who hear better in a noise.

Those persons in whom this phenomena can be produced are only marked examples of a physiological reaction of one sense upon another. For instance, some blind persons see these sound colors after the report of a cannon.

The same or analogous physiological conditions can be provoked, as we have shown, by excitation of different centers, showing that the brain centers are acted upon by the same force. We consider this to be simply *molecular vibration.* All sensation is the result of this force, the different senses are but appreciations of various degrees and characters of these vibrations.

If in a given individual the effects of an excitation of the nerves of special sense were absolutely equivalent, the corresponding sensations would be confounded. These phenomena are illustrations of the great principle or law underlying all natural action—that of the "Correlation of Forces."

They are due to a simultaneous action of external stimuli upon one or more nerve centres, the molecular vibration being propagated from one brain center to another by reason of contiguity, or by anastomoses of nerve fibres. Any disturbance of a special sense gives rise to its peculiar perception. That these phenomena take place entirely in the brain itself, the special sense organs having no action, cannot be denied.

The sense of sight is but a very highly developed sense of temperature. The retinal mechanism simply effects a pro rata reduction of the highly delicate and infinitely divided kinetic energies of the ether wave stimuli into such relatively finite quantities as can alone affect nerve force. It is a translator from the language of the imponderable to the known of neural vibrations. It also transfers these degrees of stimulation to the nerve fibres which convey them to the cerebral color and light producer This process of reduction and transfer is

through the medium of molecular activities aroused in the retinal receptive organ by the stimulus and perceived by the end organ only according to the height and degree of the aroused molecular activity.

Some facts from biology and embryology claim our attention. The brain and skin are both differentiations of the epiblast. The eyes are essentially dermal structures, being nothing more than a special further development of a nerve and a spot of skin; the retina being the nerve, and the cornea, sclerotic, etc., the skin. In some animals without eyes, as in the medusæ, certain spots upon the skin of some parts are susceptible to light of any kind. A still higher development is found in the pineal eye of some of the extinct vertebrata, which was covered by a translucent skin, being only susceptible to light and having no true vision. These examples simply show an increase in delicacy of the organ and a specialization of certain parts; the grosser waves of ether (i. e., heat) affecting it less and less, and the finer (i. e., light) more and more.

Mr. Gladstone advanced an idea (evolved from his study of Homer and the Vedas), in which he was upheld by a distinguished German scholar, Dr. Hugo Magnus, that the sense of color is not an original endowment of the human race, but that about 3,000 years ago the Semitic and Aryan tribes were incapable of distinguishing between red and blue, green and yellow. Also that white light is the only kind perceived by the inferior order of animals. This view is incorrect. It is not the paucity of the color impressions in uncivilized races that gives rise to this conception, but the poverty of the language to describe them. Mr. Grant Allen, in his examination of the eyes of various uncivilized tribes, found the color sense perfect. White light is the purest we know of, and is the nearest approach to colorless light, which is the complete synthesis of all vibrations. The more numerous the vibrations, the purer or less colored the light, and the less visible it is. Pure light is invisible, only impure or colored light is seen and therefore visual perception is of color and not of light. The

simplest form of visual apparatus has probably but few differentiations of impure light at its command. As the higher forms of life are examined the number of received impressions increases. Then we all know that flowers are variously colored for the attraction of insects, etc. Many forms of life are colored as a protection, simulating their surroundings.

An abnormal state of any part of the nervous apparatus, the retina, optic nerve or different parts of the cerebral center will cause some alteration in the normal sensation. As the retina is merely a disc-like expansion of the optic nerve, we may divide cases of abnormal color perception into central and peripheral. For example, in hypnotism and the psychic blindness of aphasia, the abnormal color perception is clearly cerebral (or central). Also in the effects of certain drugs, as the yellow vision from Santonin and in alcoholism. Of the peripheral forms we have optic atrophy (where the contraction of the color field is entirely out of proportion with that of white), and cases resulting from inflammation of the retina, etc. These depend either upon the inability of the retina to take up, or of the optic nerve to carry certain vibrations. To the peripheral class belong many of the cases where shortening of the spectrum occurs. A peculiar aberration is seen in psychic blindness, where the optical memory areas are affected, and form and color are seen, but make an unfamiliar impression.

It is supposed that the normal retina and nerve respond to some ether waves more easily than to others. They seem to be unaffected by the ultra-violet and ultra-red rays of the spectrum. Is not this carried still further in "color-blindness," and other colors modified or excluded from alterations in their anatomical or molecular structure? "All we know in regard to differentiation of impressions points to the brain as the place where the final process leading to judgment takes place, and it cannot be denied, except in rare cases where there is shortening of the spectrum, that the mistakes of the 'color-blind,' so called, are "errors of judgment." Now, where two colors are confused it is not necessary that they make precisely the same impression on the central cells; but, that on

account of the individual's "obtunded color-sensibility," they are so nearly alike that he is apt to confound them. The vibrations fail to excite the cerebral molecules in a full degree. We frequently find individuals who are unable to differentiate the finer shades of the same color. This is called a "diminished chromatic sense." Holmgren was unable to make any distinct lines of demarcation between this and what he called "color-blindness." It is utterly impossible to account satisfactorily for such phenomena on any other basis than that of defective judgment. We therefore look upon "color-blindness" as an exaggerated condition of "diminished chromatic sense." Observers are agreed that the name "color-blindness" is a misnomer, and that very few cases are really blind to color. "It is absurd to believe that because shades of red and green cannot be differentiated, that the person is really blind to either (*i. e.*, that the patient cannot see them at all). He does see them, and sees them as colors just the same as he sees yellow or blue, but cannot separate the impressions made by the one from those made by the other." We would designate all these cases under the specific heading dyschromatopsia, to take the place of "achromatopsia, which signifies *no* color vision.

Observers have studied to some extent the subject of residual sensations, or after images, of white light; but so far as I can ascertain, they have only experimented upon themselves. I have done this myself many times, but have also experimented upon ten artists and draughtsmen who were competent to make quick judgment of the fast fleeting colors.

TABLES

Showing Character of the Residual Sensations of White Light From Experiments Upon Ten Artists.

TABLE I.,

Showing Three Typical Cases With the Duration of Each Impression.

—1— V. M. Typical Spectrum.

Duration. Min.	Sec.	Colors.
		Ten sec. before image appears.
	10—20	Carmine.
	—30	Carmine rim, yellowish green center.
	—40	Pale pea green.
	—45	Crimson.
	—55	No image.
—1		Yellowish - green "ghost."
—1	10	Scarlet.
—1	15	No image.
—1	30	Magenta red.
—1	40	Prussian blue.
—1	52	No image.
—2	7	Prussian green rim, Prussian blue center.
—2	12	No image.
—2	22	Prussian green rim, Prussian blue center.
—2	32	No image.
—2	47	Bluish Payne's gray.
—3	2	Payne's gray rim, bluish center.
—3	17	Dirty Prussian blue.
—3	37	Fading away as a neutral tint ill defined.

Images stationery; of same relative size; gradually diminishing in intensity.

—2— H. R. Warm Colors.

Duration. Min.	Sec.	Colors.
		Five sec. before image appears.
	5—15	Carmine.
	—30	Orange.
	—40	No image.
	—45	Sepia.
	—55	Greenish yellow.
—1	15	Emerald green.
—1	28	Prussian green.
—1	35	No image.
—1	40	Yellowish - green "ghost."
—1	55	Fading away, as very light yellowish green.

Images usually at bottom and rise to top of visual field; they gradually increase in size to the *emerald green* and then diminish both in size and intensity.

—3— J. H. K. Cold Colors.

Duration. Min.	Sec.	Colors.
		Sixty sec. before image appears.
—1 —1	10	Yellowish green
—1	20	Prussian green.
—1	30	Light Prussian blue.
—1	40	Dark Prussian blue.
—1	50	Bluish purple.
—2	10	Indigo.
—2	30	Neutral tint.
—2	45	Black.
—3	5	Fading away as a shadowy neutral tint.

Images usually appear at top and sink diagonally downward to bottom of visual field; they gradually diminish in size and intensity. Sizes, colors and directions can be altered at will.

TABLE II.

Twenty Seconds Exposure.

—4—

D. W. G.

1. Greenish-yellow center; red rim.
2. Yellow.
3. Yellow center; carmine rim.
4. Pink.
5. Carmine.
6. Carmine center; purple rim.
7. Reddish purple.
8. Purple center; Prussian blue rim.
9. Indigo center; light blue rim.
10. Carmine ("ghost.")
11. Indigo.
12. Neutral tint.

Images float about the field. Colors merge.

—5—

J. B. T.

1. Greenish-yellow.
2. Yellow.
3. Orange.
4. Light red.
5. Carmine.
6. Light blue.
7. Reddish purple.
8. Carmine ("ghost.")
9. Prussian blue.
10. Pur le ("ghost.")
11. Prussian blue.
12. Indigo.
13. Light blue.
14. Payne's gray.

Images disappear between colors floating upward

—6—

G. S.

1. Yellow.
2. Carmine.
3. Purple.
4. Prussian blue.
5. Prussian green.
6. Light green.
7. Prussian green ("ghost.")
8. Prussian blue ("ghost.")
9. Indigo.

Images disappear between colors gradually diminishing in size and intensity.

—7—

H. G.

1. Red center; bluish rim.
2. Orange.
3. Olive green.
4. Prussian green.
5. Olive green ("ghost.")
6. Prussian green.
7. Light blue.
8. Prussian blue.
9. Light blue ("ghost")
10. Prussian blue.
11. Payne's gray.

Images gradually diminish in size and intensity.

—8—

H. S.

1. Prussian blue.
2. French blue.
3. Indigo.
4. Neutral tint.

Sizes, colors and directions can be altered at will.

—9—

C. M.

1. Yellowish-green.
2. Orange.
3. Orange center; red rim,
4. Prussian blue.
5. Purple.
6. Dark purple.
7. Mauve (shadowy).

Images diminish in size to the Prussian blue, and then increase; colors gradually diminish in size and intensity.

—10—

H. V. W.

1. Mauve.
2. Purple.
3. Prussian blue.
4. Purple ("ghost.")
5. Prussian blue.
6. Indigo.
7. French blue upper half; indigo lower half.
8. Light indigo.
9. Payne's gray.
10. Neutral tint.

Images diminish in size and intensity dropping diagonally downward; sizes, colors and directions can be altered at will.

A number of methods have been tried, but the following is probably the best: A white piece of paper was placed upon a dull black back-ground and looked at in the sunlight for a certain length of time. (Fig. 4.) Then the eyes were gently

FIG. 4.

closed and covered with the hands so as to exclude all light. Then a vivid image appeared, the color of which was named and committed to paper by a second person. This image changed to another color, and then to others, finally disappearing.

The personal equation of each observer is, of course, of some consequence, as some persons appreciate colors more easily than do others, but I find that after images, as a rule, follow the colors of the spectrum, beginning at the upper end and continuing to the lower. The impressions may be modified to a considerable extent by the will. For instance, one of my subjects, after practice with these colors, always saw a full spectrum immediately upon the closure of the lids. In some cases the image may be altered in size, or it may be made to move about the field by a process of expectation. Also the image may be excluded or the colors may be modified at will by the subject. There are times when the image does not gradually merge into the next but disappears suddenly, appearing in a different color. Pressure upon the globe of the eye influences the color and appearance of these images. This is due to the fact that any irritation of the nerve or retina gives rise to a sensation of light. Sometimes a color is entirely omitted (the image not being appreciated at the time it

ought to appear). Sometimes only the first part of the spectrum is seen, and sometimes only the last part. In my own experience fully a minute elapses before I see any image[1]. On some days more colors are distinguished or the list is lengthened by the addition of one or more colors at either end. When a color, for instance, purple, which is usually thought of as being compound, is viewed out of order the sensation is psychical, being due to a changing from the red to the blue, confusing the two impressions. When other simple colors appear out of order they have been seen before and are "ghosts" or revivals of preceding impressions.

This is proved by making a half dozen exposures closely following each other; when the eyes are closed no very distinct views are obtained and colors follow without definite order When the eyes[2] are suddenly turned the image gradually gets in line with the visual axis, this is due to the fact that the mind projects all objects into space, and as the cells in the brain corresponding to the maculæ were primarily provoked, the mind considers that the image seen should be in the line of the visual axis.

The brain is the workshop of the soul and indeed its entire world is constricted within the narrow limits of the cranium The ego is cognizant of nothing that goes on outside of the brain; every action in the body (which can be appreciated) is telegraphed to the brain, and there makes some change which is referred to a position in space, as Epicharmus, the old Greek poet says, "T'is mind alone that sees and hears, all things besides are deaf and blind."

In all action there is a disintegration of tissue, and it is reasonable to suppose that when the central cells are irritated, there is some change in the molecular relation of their constituents. This change may be evanescent, lasting but for a fraction of a second, until the reparative process is complete. If the irritation is kept up for a length of time, or repeated, or

[1]In such cases the first part of the spectrum is seldom seen.

[2]Or eye experimented upon.

if it is of great intensity, the impression or change is more permanent. Finally, the impression may be of such a nature as to be carried to the memory cells of the brain, where it may make either transitory or permanent changes. Another kind of residual sensation is observed after certain operations on the eye, when the patient sees everything colored violet or reddish. This continues from fifteen minutes to one hour, and is due to an after image of some bright object.

These residual sensations are simply memories, the successions of colors being due to disintegration of the white light impressions in the brain cells themselves. The fact that the action is ever decreasing in intensity is due to the gradually lessening impression, some waves irritating for a longer time than others, and to the reparative processes going on in the recipient tissue. I have tried these experiments in many ways, and with other than white light. On every side they uphold the statement that differentiation of color is effected in the brain and not in the retina.

Burnett divides vision into quantitative and qualitative. The first relating to the size of the image, *i. e.*, the number and relationship of the retinal elements (and the corresponding elements in the brain) that are acted upon. (At a distance of less than 20 feet another factor comes into play, a sort of muscular sense developed by education, *i. e.*, the accommodation and convergence of the eyes.) Qualitative vision is the color sense proper, resulting from a discrimination between changes experienced in the brain cells between ether waves of different lengths and rates of motion.

Are there then separate centers in the brain for light, form and color perception, or for separate the colors? I see no necessity for the assumption.

Burnett says: "I would suppose the cerebral molecules or atoms to be capable of vibrating in the same phases as their corresponding molecules in the retina, or going farther back still, in the substance of the luminous body itself. Of course, under this hypothesis it is not demanded that there be a special phase of vibration for every distinctly-perceptible color

and shade. It is still possible to divide colors into "primary" and "combination." As for myself I should regard as "primary" all those colors which are clearly distinguished as such in the full solar spectrum. All others I would regard as "combination colors." "

White light is more intense than colored, since it is the sum of all the ethereal vibrations. The whole must include all of its parts. All white light sensations can be resolved into their constituent elements of color sensations. Therefore, there is no necessity for separate color centers, nor is there need for a separate form center, if we accept the explanation given of quantitative vision.

As stated, this paper is mainly a review, bringing together the more important theories advanced from time to time concerning color perception, and an attempt to record a few thoughts in support of, what the writer believes to be, the rational view of the subject.

The way for any theory to become a recognized law is for each observer to contribute his mite, however meagre, towards its establishment.

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OCULAR HEADACHE.

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As usual, concerning any topic under discussion by myself, I shall, at the outset, try to show that my ideas, upon it, are in accord with those of some other men who are generally regarded, by *connoisseurs*, as having a right to speak of it authoritatively.

Dr. Wm. Thomson[1] reports that: "Of 1,000 cases of refractive errors, Bickerton found that in 277 headache was a distinct symptom." Dr. Thomson, in the same place, speaks of an article of my own,[2] as one of "other praiseworthy efforts to popularize the subject." This is cited only to indicate that Dr. Thomson considers such efforts "praiseworthy." Seventeen other authors are quoted, in Dr. Thomson's work, (on the page cited and the one succeeding it) as having found eye-strain to be a source of headache.

In Landolt's work on refraction and accommodation, the author[3] says: "The myope often experiences at the bottom of the orbit, or even in the entire forehead, a sensation of pressure which may become a genuine cephalalgia. The pain becomes more and more intense and more and more frequent, sometimes even constant, and often takes on the character of a neuralgia. Indeed it is not rare to see these phenomena, as also asthenopia generally, mistaken for neuralgias dependent

[1]Thomson. Sajous' Annual of the Universal Medical Sciences, 1888, Vol. III, p. 152.

[2]Culver. Albany Medical Annals, Vol. VIII, p. 137.

[3]Landolt. The Refraction and Accommodation of the Eye, p. 456.

upon some affection of the nervous system, and treated accordingly, without, of course, any success, and to the detriment of the general health."

Under the heading of Hyperopia, Dr. Landolt[1] writes, in the same work: "Others * * * are early tormented by symptoms of asthenopia, provoked by the excessive working of their accommodative muscles. * * * A sensation of heaviness, which may pass into real pain, invades the eyes and forehead. This cephalalgia may take on the form of a genuine migraine and render impossible, not only all work, but even the fixation of the most distant object."

Let me say, parenthetically, that I do not suppose I am communicating *news*, herein, to educated oculists. The subject has so progressively excited my interest, of late years, that I deem its discussion a *potential* source of benefit to any reader, whether of the laity or of my colleagues.

In his work on "Functional Nervous Diseases," Dr. Stevens[2] devotes twenty-five pages, directly, to the consideration of headaches produced by ocular anomalies.

In the transactions of the Pennsylvania State Medical Society, for 1886, Dr. Edward Jackson[3] published a valuable article on "The Relation of Eye-strain to Headache." The first words of it are: "Headache due to eye-strain is very common;" and the rest of the article abundantly demonstrates the truth of that initial statement.

In the New York *Med. Rec.* (an issue of September, '76, of which I cannot give the exact date, only a reprint being now at hand) Dr. Stevens[4] said that: "In more than one hundred cases of severe, recurring headaches, including several which were clearly of the form called migraine, refractive anomolies have been found without exception."

In an article entitled "Oculo-Neural Reflex Irritation," read

[1]Landolt. The Refraction and Accommodation of the Eye, p. 370.

[2]Stevens. Functional Nervous Diseases, p. 35-60.

[3]Jackson. Transactions of Pennsylvania State Medical Society, 1886.

[4]Stevens. New York Medical Record, September, 1876.

before the International Medical Congress, in London, England, August, 1881, the same author[1] said: "The results of observation in several hundred carefully recorded cases of such diseases as neuralgia, chorea, insomnia, *headaches* (Culver's italics), and even epilepsy have fully confirmed the opinions long since expressed by me that difficulties in performing the function of sight are among the prolific sources of nervous diseases."

In the New York *Med. Journ.* for April 16, 1887, may be read what Dr. Ambrose L. Ranney said in a meeting of the New York Neurological Society (March 1, 1887), viz.: "I do not pretend to speak as an oculist, but as a neurologist: * * * * I have never yet encountered a case of typical migraine in which some form of eye-defect did not exist."

In the first fasciculus for 1888 of the *Annali di Ottalmologia*, Dr. Rampoldi[2] reported a case of hemicrania, which had been under his observation and treatment.

Dr. Ambrose L. Ranney[3] has written: "I believe that the symptoms of sick-headache are of a reflex character, to a large extent, and are due, primarily, in almost every case, to some optical defect." Again: "I do not think the relationship between eye-strain and attacks of headache or neuralgia can be denied."

Dr. Henry D. Noyes[4] asserts that "not a small percentage of headaches originate in disorders of the ocular muscles."

Dr. C. S. Bull[5] says: "Many cases of obstinate headache, which have resisted all treatment, originate in disorders of the ocular muscles and disappear when these disorders are corrected."

In January, 1885, Dr. G. S. Norton[6] published an article

[1]Stevens. Alienist and Neurologist, January, 1882.

[2]Rampoldi. *Annali di Ottalmologia*, Fasc. I, p. 58.

[3]Ranney. New York Medical Journal, Vol. XLIII, p. 231.

[4]Noyes Diseases of the Eye, p. 88.

[5]Bull. In Soelberg-Wells, Diseases of the Eye, p. 719, 4th American edition.

[6]Norton. The Hahnemannian Monthly, January, 1885.

on "The Eye as an Agent Causing Headaches and other Nervous Disturbances." Therein, in twenty-eight cases, is shown the connection between the various forms of refraction and headache, or other nervous disturbances.

Before the *Societe Francaise D'Ophtalmologie*, on the 31st of January, 1884, M. Martin,[1] of Bordeaux, sought to demonstrate that, in a vast majority of cases, migraine is dependent on astigmatism. In such demonstration he was supported by Javal;[2] he was opposed by Dianoux, but, as I presume to think, with a statement that was simply false.

Galezowski,[3] in the *Recueil D'Ophtalmologie*, has written concerning ophthalmic migraine and its semeiological value.

De Latourelle[4] reported to the *Societe de Biologie*, in June, 1887, a case of ophthalmic migraine.

Dr. Parinaud,[5] in 1887, wrote concerning ocular cephalalgias. In the article he says: "*C'est dans l'appareil musculaire de l'oeil que reside presque toujours la cause de la cephalalgie.*" "(It is in the muscular apparatus of the eye that the cause of cephalalgia almost always resides.)"

In 1883, Dr. Eperon,[6] who wrote the bibliographical analysis for the *Archives D'Ophtalmologie*, reviewed the thesis of Dr. Raullet,[7] on ophthalmic migraine. Dr. Eperon wrote: "*La migraine ophtalmique, observee par Piorry, a fait dernierement le subjet de travaux interessants de M. Charcot et de son eleve M. Fere.*)" "(Ophthalmic migraine, observed by Piorry, has lately been the subject of interesting work by Charcot and his pupil, Féré.)"

The present writer, Culver, was once a student under Char-

[1]Martin. *Archives D'Ophtalmologie*, Tome IV. p. 170.

[2]Javal. *Loc. cit.*

[3]Galezowski. *Recueil D'Ophtalmologie*, IV, No. 9, p. 536.

[4]De Latourelle (cited by reviewer, Dr. Rolland), *Recueil D'Ophtalmologie*, 1887, p. 622.

[5]Parinaud. *Recueil D'Ophtalmologie*, 1887, p. 663, also vol. III, 1883, p. 467.

[6]Eperon. *Archives D'Ophtalmologie*, 1883, Tome III, p. 537.

[7]Raullet. Th. Doct., Paris, 27 Juin, 1883.

cot, and although it might not be easy to formulate his reasons for holding the opinion, he thinks it a considerable concession on Charcot's part, that there *is* such a thing as ophthalmic migraine.

Féré[1] also reports a case of ophthalmic migraine, followed by death; in another place he discusses the treatment of ophthalmic migraine[2].

Snell[3] has written about "Recurrent Paralysis of the Third Nerve, with Attacks of Migraine."

It seems strange to me that in my study of this subject, I have found so scanty reference by German authors to ocular headache. My former master, Schweigger[4], refers to it, but merely as a part of asthenopia. I am not now pretending to compile a complete bibliography of the topic, but, if my citations seem to ignore German works, the possible inference may be precluded by my saying that I believe it to be a *fact* that ocular anomalies are largely more productive of headache than they are commonly supposed to be; and that Germans have for more than half a century done more than half of the valuable scientific work, bringing forth a knowledge of *facts*, that has been done in the world.

Dr. Stewart[5] gives the history of a case of what I would class with ocular headaches, though the connection is not as direct in the case reported as it often is.

Mr. Brudenell Carter[6] gives the history of a case, which I[7] have already cited, in another article, wherein intense headache had been a prominent symptom, but disappeared when Mr. Carter treated the patient's eyes, merely prescribing con-

[1]Féré. *Revue Mensuelle de Medicine*, III, *4*.

[2]Féré. *Progr. Medical*, No. 23, p. 454.

[3]Snell. The Lancet, No. 21. (1885).

[4]Schweigger. *Augenheilkunde*, Vierte Auflage, p. 50.

[5]Stewart. American Journal of Ophthalmology, vol. V, p. 184.

[6]Carter. Eyesight, good and bad, p. 144, and Diseases of the Eye, p. 563.

[7]Culver. Albany Medical Annals, vol. VIII, p. 158.

cave glasses, mainly to establish harmony of accommodation and convergence.

Dr. Swan M. Burnett[1] considers this subject of ocular headache, briefly, and quotes Dr. S. Weir Mitchell as having called attention to it in 1876.

I now propose to cite ten cases of headache that has succumbed to my own ocular treatment:

Case I. Mr. W. S. S., æt. 52, consulted me Feb. 9th, 1888, at the suggestion of Dr. J. D. Featherstonhaugh. Eighteen years earlier had had an iridectomy performed on left eye. Three years ago, another of my local colleagues prescribed glasses for near-work. The left cornea is of so irregular curvature that vision in that eye amounts to only $^{15}/_{CC}$, which no glass improves. He said that the glasses he had had were each sph.$+^{1}/_{18}$; but I did not have a chance to see them. Vision of right eye was $<^{20}/_{XXX}$ but, with a Cyl.—1.75 D. axis 15°, it became equal to $^{20}/_{XX}$.

My prescription was simply a Sph.+2.00 D. ⌒ Cyl.—1.75 D., axis 15°, for the right eye, and a plane glass for the left eye, these being for use when doing near work. The patient is paymaster in the Harmony Mills and has much clerical work to perform. This prescription was dated the 8th of Feb. 1888. Result: On the 18th day of the same month he wrote: "I cannot spare the glasses, which suit me to a T." May 5, 1889, he orally communicated with me, personally, to this effect: "I used to be crazy with headache all the time; I have never had a headache since you sent me the hook-bowed spectacles."

Case II. Miss M. F., a schoolgirl, æt. 13, consulted me the 19th of March, 1887, at the suggestion of Dr. Franklin Townsend. Dr. Townsend had previously told me that he prognosed convergent strabismus, in that case, unless her eyes soon received appropriate treatment. Her head had ached a great deal. I found the eyes to be, on inspection, perfectly normal in all respects. There was hyperalgesia at *each* supraorbital

[1]Burnett. Treatise on Astigmatism, pp. 151-152.

notch, and each infraorbital *foramen*. There being present no manifest anomaly, but latent hyperopia and latent convergent strabismus, I thoroughly atropinized both eyes; then, during complete mydriasis, the right eye, without a glass, had V.$<{}^{20}/_{c}$; with a Sph.+1.75 D., it had V.$={}^{20}/_{xx}$; at the same time, without a glass, the vision of the left eye was V.$={}^{10}/_{cc}$; with a Sph. +4.00 D. ⁀ Cyl.+0.50 D., ax. 90°, V.$={}^{20}/_{xx}$. I made some allowance for the strength of glasses because of her youth, and left about a dioptry of her general hyperopia uncorrected by the glasses I prescribed. By the way, I now doubt the wisdom of making such allowance. Result: Just two months after her consultation with me, and while I was out of the city, Dr. Thomas Featherstonhaugh, then my associate in practice, saw the patient. I append his record. "Child, previous to visits here, used to have most intense headaches, accompanied by vomiting. She was treated for biliousness, etc., but got no relief until glasses were prescribed. She now has no headaches, and has not vomited since her first call here."

Case III. Miss I. T., lady æt. 20, had had vertigo since the spring of 1887. Had no symptoms peculiar to the eyes, but Dr. A. Van Derveer advised her to consult an oculist. She consulted me November 16, 1887. Her subjective history included the apparent vertical elongation of distant lights, great nervousness, and headache induced by near work. On the 19th of November, 1887, I prescribed for the right eye, Sph.+0.75 D., and for the left eye, Sph.+0.75 D., ⁀ Cyl.+0.50 D., axis 180°, these lenses mounted as eye glasses. By von Graefe's test, on the 17th of April, '88, there was endophoria for five metres, that was corrected by 3° of old-fashioned angle-of-opening prism, and whose maximum correction was 5° of the same sort of prism. On the 8th of May, '88, I replaced the Sph.+0.75 D., right lens with a S.+0.75 D. ⁀ prism 2° (angle of opening) apex toward nose. Result: On the 24th of January, '88, I had a report that my treatment had relieved the former headaches. May 8, 1888, the report, as recorded in my case-record, reads: "Hasn't had so much headache since she has had the glasses I prescribed, but has had a *few*

severe attacks." I afterwards learned that at first these glasses were worn by my patient only in a desultory way. Feb. 16, 89: "Patient has no more sick headaches now, but does have left temporal headache." I used orthoptic training of the interni and enjoined more nearly constant use of glasses. Sixth of June, '89: "Patient's sister reports that patient's headaches have quite ceased."

Case IV. Mr. G. P. W., merchant, æt. 52, consulted me the 12th of May, 1885. With his right eye, without a glass, V.= $^{15}/_{xxx}$: Left eye, without a glass, V.=$^{15}/_{xx}$. Either eye with Cyl.+0.75 D., axis 90°, V.=$^{15}/_{xv}$. In this case a rule-of-thumb prescriber had signally failed. Mr. W., after having my prescription filled, compared the resulting glasses carefully with the rule-of-thumb glasses (prescribed, unfortunately, by a colleague). The patient found that his head ached whenever he used the latter glasses, and that it never ached when he used the sphero-cylinders, prescribed by myself, under corresponding circumstances.

Case V. Miss R., æt. 16, schoolgirl, consulted me April 9, '89, to learn if treatment of her eyes would relieve her very annoying headache. I found each eye myopic and prescribed lenses correcting *real* myopia. I did not regard her as a typical victim of ocular headache, and so reported to herself and to her father. But she had worn a sphero-cylinder in front of the right eye, before I saw her. When she consulted me, a simple Sph.—4.00 D., gave V.= $^{20}/_{xx}$; hence I knew that I could somewhat improve upon the circumstances under which her visual act had been performed, and told the patient and her father, that I expected *some* relief to attend her use of my prescription. Result: Five and a half weeks later (May 18, '89,) I received a report that Miss R. had had no headache since she had worn the glasses I prescribed.

Case VI. On February 22, 1889, Miss A. L., æt. 54, consulted me, giving a history of being "somewhat bilious," "very nervous," and having much headache. Without glasses or mydriatic, her right eye had V.$<^{20}/_{xl}$, and her left eye had V.$<$

$^{20}/_{L}$; with Cyl.+0.75 D., axis 90°; the right eye had V.=$^{20}/_{xxx}$; and with Cyl.+1.25 D., axis 90°, the left eye had V.=$^{20}/_{xxx}$; V.=$^{20}/_{xxx}$ was the best vision obtainable for either eye by a glass. I prescribed proper correcting glasses, for use during distant-vision, and proper sphero-cylinders for use when doing near-work. Result: Nearly three months later (May 16, '89,) my patient reported, orally and personally, that her headache had not recurred since she had worn the distance-glasses I had prescribed.

Case VII. On the 19th of December, 1885, Mrs. McC. consulted me, giving an account of having suffered much from severe nervous headache. So-called "walking glasses," (each Sph.+1.50 D.,) had been prescribed for her, as well as right Sph.+3.50 D., and left Sph.+4.00 D., for reading purposes. Without glasses or atropine the right eye had V.<$^{15}/_{LXX}$ and the left eye V.=$^{15}/_{C}$; I found that Sph.+1.50 D. ⁀ C.+1.00 D., axis 180°, gave the right eye V.=$^{15}/_{XV}$+; and that Sph.+1.75 D. ⁀ Cyl.+0.50 D., axis 180° gave the left eye V.=$^{15}/_{XV}$; I prescribed such glasses for distant vision, and near-work sphero-cylinders, of strength to correspond to the requirements made by my patient's natural presbyopia.

Result: On the 22d of May, 1888, Mrs. McC. reported to me that she had been completely relieved from headache and eye trouble, ever since she finished treatment under me, over two years before. (It may be well to add that a course of tonic treatment, conducted by myself, had been undergone by my patient, who would never have gotten the benefit of my optical prescription, had she not fitted herself for it by intelligent persistence, and a course of quinine and strychnia).

Case VIII. On the 27th of Feb., '89, Miss C. M. V. D., æt. 30, a lady whose time is much occupied by sewing, consulted me, giving a history that from the 23d of Feb., '88, she had had headache every day for three weeks; then eyesight, for sewing, was blurred; the headache she described was temporo-frontal, sub-bulbar and bulbar; stomach was somewhat out of order. Either eye, without glasses, had V.=$^{20}/_{XX}$; either eye with Sph. +1.00 D., ⁀ C.+0.50 D., axis 90°, had V.=$^{20}/_{XX}$; koroscopy

having shown me that the least hyperopic meridian (vertical) of each of her eyes had a hyperopia of 1.50 D., I prescribed for each eye, Sph.+1.50 ⌒ Cyl.+0.50 D., axis 90°. A week later, with the spectacles I had prescribed, both eyes, together had V.=$^{20}/_{xx}$; either eye alone, with the glass I had prescribed for it, had V.=$^{20}/_{xx}$.

Result: Just three months after having received my optical prescription, she wrote to me about the glasses, saying: "I have worn them steadily and I think that they have helped me. * * * In sewing or reading I have no trouble." In that letter she made no special mention of her former very troublesome headache. I wrote, asking how *it* had been affected by my prescription. On the 2d of June, '89, she answered me, saying: "* * About my headache—I had nearly forgotten all about it, as I had been free from it for nearly three months. —I also find on taking a day for pleasure, or riding on the cars, I have suffered no headache (since I have had the glasses) and before that I could not ride a very short distance on the cars without suffering for hours with a headache. The day I went to Albany, last winter, I fought headache all day (by taking headache medicine) to drive it off, but it came on at last, but not so severely; but the day I came home, having on the glasses (and I spent about five and a half hours in Pittsfield, so not reaching home till six o'clock at night, leaving home at ten o'clock) I did not have a touch of headache at all."

Case IX. On the 19th of October, 1887, Mr. N. J. G., a theological student, æt. 26 years, consulted me, as he had been advised by my former pastor and friend, Dr. T. G. Darling, to do. He gave a history of severe frontal and temporal headache, and "malaria," the causation of the headache being ascribed by the patient, himself, to "eye work." His headaches and malaria had forced him to leave the theological seminary. When I first saw him there was no mydriasis, and each eye, without a glass, had V.<$^{20}/_{xx}$; the right eye, with a Cyl.+0.50 D., axis 45°, had V.=$^{20}/_{xx}$; and the left eye with a Cyl.+0.50 D., axis 115° had V.=$^{20}/_{xx}$; *experientia* certainly *docet*, and, although I had not, then, the advantage, which I

have since acquired, of using the shadow-test accurately, I had no faith in the really beneficial action of these cylinders with obliquely inclined axis, and so I told Mr. G. No spheric glass was at all accepted by either eye, when I first saw him. Acting on my advice, he permitted me to thoroughly atropinize both eyes; then it was a Sph.+1.25 D., $\bigcirc$ Cyl.+0.50 D., axis 90°, and a stenopaeic aperture, of three millimetres diameter, which brought his vision up from its natural V.$<{}^{20}/_{LXX}$ to ${}^{20}/_{XX}$; and it was a Sph.+2.00 D. $\bigcirc$ Cyl.+0.50 D., axis 90°, and the same kind of a stenopaeic disc that did the same thing for the left eye, giving it normal vision. I prescribed spectacles corresponding to the result of my examination.

Result: On the 3d of November, 1887, Dr. Darling wrote to me, saying: "Yesterday I heard from Mr. G., who was very hopeful, and the cheerfulness was evidently giving him a stronger grip on life and work."

On the 25th of November, '87, Mr. G. wrote me, saying: "It is now one month since I began to wear the glasses. I experimented with them this morning by going without them for a couple of hours, but am glad to get them on. They are now no trouble to me, and in every case I can see clearly with them. My head does not get weary now when I work."

Case X. Miss S. E. B. consulted me June 10, 1886. She gave a history of having had, ten years before, what I think, from her description, must have been phlyctænular keratitis, and for which Dr. Robertson had successfully treated her, with the classical remedies, calomel, cod-liver oil, etc. When she consulted me she had lately had headaches which the usual remedies had failed to relieve. She ascribed the headaches, herself, to the use of her eyes. Either eye, without a glass, had V.$<{}^{20}/_{XXX}$; with Cyl.+0.75 D., axis 90°, the right eye had V.$={}^{20}/_{XX}$; with Cyl.+1.00 D., axis 55°, the left eye had V.$=$ ${}^{20}/_{XX}$. I prescribed such glasses, only, her age being less than that at which presbyopia is supposed, by most of us, to become manifest.

Result: A little more than four months later (Oct. 18, 1886) Miss B. reported herself perfectly well, and that she had

found her spectacles indispensable. I have seen the patient several times since then, and the report continues as satisfactory as it then was.

My present opinion is that ocular headache is a topic worthy of further discussion, and my present purpose is to discuss it further in the future.

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TRAUMATIC CATARACT WITH OCCLUSION OF PUPIL BY FALSE MEMBRANES AND COLOBOMA OF THE IRIS.

BY H. V. WUERDEMANN, M.D., WASHINGTON, D. C.

Unfortunately cases of irido-cyclitis are not very rare and even under the most skillful hands sometimes go from bad to worse. The results of these cases are usually left alone, especially when only one eye has been affected.

The case cited below may be deemed rather uncommon, both from the number of traumatisms and the fortunate results obtained by the operations.

August 1, 1888, J. H. B., male, white, æt. 25, a blacksmith, was sent to me by Dr. Pyles, of Anacostia, D. C.

Previous history: On April 15, 1888, while working at the forge, he was struck by a piece of hot metal from a horseshoe upon the inferior nasal quadrant of the *left* eye, on the sclerotic near the limbus. The eyes were open at the time of the blow. He suffered no immediate consequences except smarting of the eye, and resumed his work on the following day. About forty-eight hours later the sight of this eye became dim and within a few hours all vision was lost.

He consulted an ophthalmologist and about a month later he resumed work. On May 20, he was again struck, this time by a piece of cold metal (a chip from the hammer) upon the closed lids of the *right* eye. The organ became very much inflamed, but as the patient was out of work it received no

special treatment. The patient, being nearly blind, applied later at several hospitals, but received no encouragement.

Present condition: Somewhat anæmic, but no general disease could be detected. L. E.; V.=$^2/_{cc}$; Tn—1; scotoma in upper and outer portion of visual field; small depression on lower nasal quadrant of sclerotic. Ophthalmological examination; extensive detachment of retina in lower nasal quadrant corresponding to scar on outside of sclerotic. There seemed to be considerable subretinal fluid. R. E.; V=perception of light; Tn; slight ciliary congestion; cornea and aqueous clear; anterior chamber very shallow; exclusion of the pupil (no communication between anterior and posterior chambers); vertical coloboma of iris (Fig. 5); pupillary space completely filled by masses of exuded lymph; the iris muddy and swollen; slight pain in blephorospasm. Everything pointed to

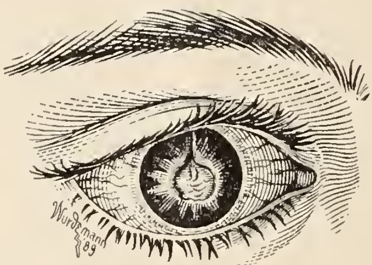

FIG. 5.

this as the result of a severe plastic iridocyclitis with some remaining irritation.

Treatment: Tonics; $^1/_2$% sol. of atropine and hot fomentations to R. E.

October 20, 1888, all signs of inflammation having subsided, a 5% sol. of atropine was dropped into the eye morning and night for one week.

November 9; general health improved; L. E. The subretinal fluid has been absorbed but now a rupture of the choroid is observed, and the choroid and retina seem to be undergoing

atrophy. The scotoma has extended to the entire outer half of the visual field and V=fingers at one meter.

R. E. No iritis; a little more light observed through the pupil; visual field good by candle test. Ordered alterative mixture.

November 16; hoping that the edge of lens might be clear and wishing to establish a communication between the anterior and posterior chambers, I made a large downward iridectomy on the R. E. under cocaine, and also clipped one side of the iris free from the membranes by scissors described below.

November 25; the lens was found translucent enough for the patient to count fingers at 1½ meters. The iris had fallen back to a normal position. The choroid and retina of L. E. slowly becoming atrophied.

February 1, 1889; the lens of R. E. had been gradually becoming opaque until vision was again reduced to the perception of light. The operation of discission of the cataractous lens was resorted to at intervals of three weeks.

April 20; the capsule and false membranes were torn through by use of two needles and a small black pupil appeared, and some lense substance still remained and was broken up. Patient could count fingers after the operation.

May 10; as the hole in the false membrane had closed, a new artificial pupil was made as before, by two needles; at the same time some synechiæ were cut, blood being effused into anterior chamber, and when seen a few days later the pupil was again occluded.

May 15; while skylarking in his room he received a slight blow upon L. E., which destroyed its remaining vision. Ophthalmoscopic examination disclosed a new dislocation of the retina in the outer segment. V=perception of light in only the lower portion of field. Tn.—1. This was the third accident happening to the eyes in one year.

May 25; under antiseptic precautions, the lids being fixed by a stop speculum and the ball held steady by an assistant, I made an incision with a keratome, 7 mm. long, in the upper portion of the cornea; then passing the long iris forceps into

the anterior chamber the membranes were seized about the center of the pupillary space and dragged forward until they touched the posterior layer of the cornea (Fig. 6). Then my delicate iris scissors were carefully passed into the anterior chamber and the portion of membrane seized by the forceps was cut out, leaving a clear button hole pupil. (Fig. 6). The

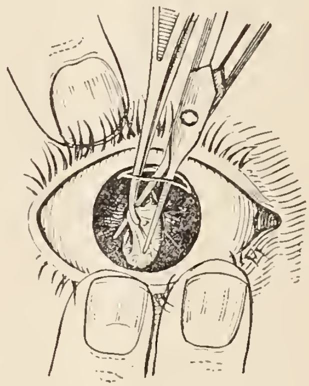

Fig. 6.

adherent colomba was excised by a simple iridectomy. A few small vessels being cut during the operation occasioned some hæmorrhage. The blood in the anterior chamber was

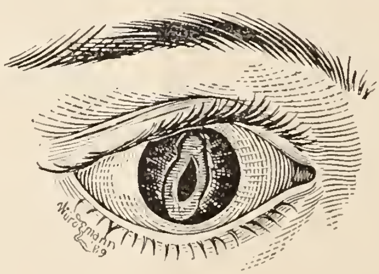

Fig. 7.

washed out by a solution of corrosive sublimate 1:5000. The eye and lids were again bathed in the antiseptic solution and a compress bandage put on. The portion of membranes excised was nearly 2 mm. in thickness.

May 29; a large blood clot was seen in the anterior chamber and V=perception of light; ordered iodide of potassium in warm milk.

June 11; the blood had been absorbed and V. counting fingers at 2 meters and with $+120={}^{5}/_{L}$; disc and retinal vessels were distinctly observable by the ophthalmoscope. Later I shall probably make some change in the glass correcting any existing astigmatism. By the aid of this glass the patient can see distinctly faces and read very large print. He is thus transformed from a charge upon the community to a producer—as he is now fitted to take up some kind of work.

Needing a pair of very delicate scissors for the operation described above, and not liking such complex affairs as De Wecker's, I designed a pair which were very skillfully made for me by the firm of Tiemann & Co. Mr. Stohlman of that firm has suggested the name of "Humming-bird-beak scissors" from their extreme delicacy.

These scissors bite perfectly in the whole length of the

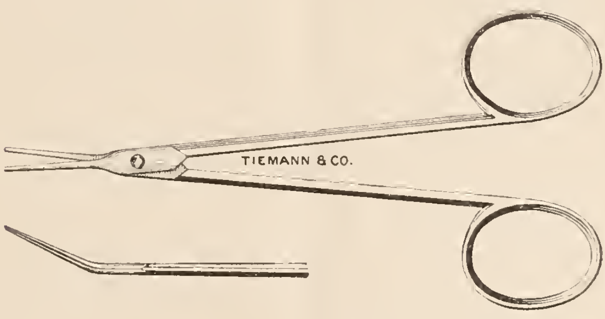

Fig. 8. Two-thirds Actual Size.

blades and are applicable for "inside" operations; they can also be used for iris operations and subconjunctival tenotomy. The instrument has exceeded my expectations both from its exquisite finish and perfect working qualities. The other points claimed for it are extreme simplicity and perfect asepsis. The blades can be taken apart in a moment by means of the "antiseptic" lock and are thus very easily cleaned.

CORRECTING THE WHOLE ERROR OF REFRACTION, AND THE NECESSITY FOR THE USE OF A MYDRIATIC.[1]

BY R. O. COTTER, M. D., MACON, GA.

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While the specialty of ophthalmology is yet in its early youth, this subject of the correction of errors of refraction, if not actually in its swaddling clothes, is at least a *vexata questio*. It is remarkable how teachers of ophthalmology differ point-blank in their views concerning the matter of fitting glasses for ametropia. I say *ametropia*, because I do not wish to include in this paper *presbyopia*, which is simply the need of glasses for advancing age. Some will claim that it is possible by means of the ophthalmoscope alone, to measure refraction, without paralyzing the accommodation. Practically, it is just about as easy to do this as it is to catch a bird by simply throwing salt on its tail. Others admit the necessity for the use of the mydriatic, but many of these disagree as to how much, or if the total error should be corrected.

I can certainly say that the most glaring errors which I have encountered have been in patients who have previously been in the hands of oculists who pretended to fit them for glasses without using a mydriatic. It seems hardly necessary to argue the impossibility of getting at, by means of the ophthalmoscope alone, the true state of the refraction of an eye whose ever varying muscle of accommodation must undoubtedly vitiate any attempt to measure its refraction. Of course I do not mean that we should not verify (after the use of atropine) our

[1] Read before Georgia State Medical Society at Macon, April 18, 1889.

work, with the ophthalmoscope. To leave it aside we would be liable to make serious errors, and possibly overlook amblyopia, etc. So thoroughly am I convinced of the absolute necessity of using a mydriatic, believing as I do that there is without its use such a serious element of doubt about this most difficult and delicate work, that I have adopted its employment as my rule, invariable and positive. That I have driven away possible patients who would not submit to it, there is no doubt whatever. Yet it would be a short sighted policy, to say the least of it, which would permit any oculist to let this influence him in such a matter. As to fitting the whole error: If a patient's total hypermetropia is $^1/_{20}$, why should we give him a glass which corrects only $^1/_{36}$, $^1/_{48}$, or less. Common sense ought to dictate that when we have to deal with an ametropic eye we should ascertain (by completely paralyzing the accommodation) just what the total error is. Then we should, with a fully correcting glass, bring the eye up to a condition of normal refraction (emmetropia); then the ciliary muscle will have just the normal amount of focussing to perform. When I use the term mydriatic, I do not mean a one or a two grain solution of atropia, which simply dilates the pupil, and only partially paralyzes the accommodation. I use a four grain to the ounce solution, and drop it in the eye sufficiently often to make the muscle thoroughly passive. If I had no other reason, there is one special class of cases in which I would especially insist upon the free use of atropine. These are young hypermetropes who from excessive use of their eyes have brought on spasm of the ciliary muscle. When their vision is tested they have apparent myopia. They will accept— (concave) glasses, when if we paralyze their accommodation they will require + (convex) glasses. If their parents object to the use of glasses, or we, for any reason, think it advisable to not prescribe glasses for them, there is no better treatment than the enforced rest which thorough atropinization brings about for the tired and irritated muscle.

I am more and more convinced, by daily observation, that very many cases of real myopia begin in this way among

children who are hypermetropic. Their myopia *apparent* only, at first, has by over use of the eye and ciliary spasm, become a *real* myopia at last. At the present, I am rather opposed to prescribing glasses for young *near-sighted* persons, yet I feel that the oculist who does not do all he can to call the attention of the profession to the very great importance of having many of the errors of refraction in young persons scientifically corrected, does not do his duty. Upon no subject perhaps are the laity so grievously ignorant. They are too willing to allow this important and most difficult of the oculist's work to be done in a haphazard way by opticians and itinerant spectacle peddlers. Many a young person with normal eyes, except for some easily remediable error of refraction is handicapped and pushed to the wall in the battle of life.

Of the very many cases in which the whole error was corrected, I have kept up very carefully with some seventy or eighty. In these seventy or eighty I have only in two cases found it necessary to afterwards modify the strength of the glass. The following cases are perfectly fair samples of those to be found in my case book. As a *rule*, I find it best to fit the whole error, though of course there *are* cases, for instance, where the patient's range of accommodation is considerable, where common sense plainly indicates a modification of the rule.

CASE I. Miss E., æt. 16 years. Her eyes ache severely whenever she studies. Conjunctivæ congested and suffused. Retinæ congested—not as a disease *per se*, however, but simply as a sympton. Her mother had about decided that it was useless for her to attempt to continue her studies. Vision appears as if she were myopic. Right$={}^{20}/_{\text{XL}}$, L.$={}^{20}/_{\text{XL}}$, she accepts —cylindrical glasses, axis at 180°. Under atropia the true condition is shown up. She had spasm of the ciliary muscle, with atropia R. vis.$={}^{20}/_{\text{LXX}}$, L. vis.$={}^{20}/_{\text{L}}$, R. and L. w. $+{}^{1}/_{60} \supset$ cyl. $+ {}^{1}/_{72}$ axis $90°={}^{20}/_{\text{XX}}$, and with these glasses for close use she had in two weeks' time sufficiently recovered and resumed her studies. She is now pursuing a very severe curriculum of study in a Northern seminary, in perfect comfort.

CASE 2. Mr. W. (book-keeper), æt. 23 years. Increase of his duties lately has brought on all of the symptons described in Case 1, only to a very much severer degree. He cannot hold his eyes open even, from photophobia. It took about ten or twelve days' careful treatment and absolute rest of his eyes to get him ready to have his refraction tested. Vision before use of atropia. $R = {}^{20}/_{xx}$ $L = {}^{20}/_{xv}$ nearly. With atropia, R. and $L. = {}^{20}/_{XL}$; R. and L. w. $+ {}^{1}/_{40} = {}^{20}/_{xv}$. With these glasses he almost immediately secured perfect comfort. Of course, he only needs glasses for close work, but with them for distance even, he reads ${}^{20}/_{xv}$. When he first came to me he had been trying to use two diffierent pairs of glasses, each fitted at haphazard by two diffierent eye specialists who had not used atropine. One had given him a $+ {}^{1}/_{60}$, and the other a $+ {}^{1}/_{28}$.

CASE 3. Miss. M., æt. 25 years: Health delicate, evidently from lack of out-door exercise; vision, R. and L. ${}^{20}/_{xxx}$. Had very frequent and severe headaches, especially upon close use of her eyes. She had been treated for quite a long while by an oculist for congestion of the retina. He had forbidden her to practice at the piano. I could not, upon careful examination with the ophthalmoscope, discover at this time any congestion of either retinæ. She informed me that her former oculist had simply advised her to go to some dealer and select a "weak" glass, say a $+ {}^{1}/_{60}$ and try them for close use. As she exhibited some of the symptoms of astigmatism, I insisted upon testing her refraction. I found her whole error to be corrected R. and L. by $+ {}^{1}/_{60} \bigcirc$ cyl. $+ {}^{1}/_{48}$, axis 90°. Vision with these, R. and $L. = {}^{20}/_{xx}$. With these glasses for close use she gets a hundred fold more comfort than she did before she was correctly fitted. She informs me also that she practices at the piano as much as she wishes to. We hear too much about congestion of the retina as a disease, *per se*. I can almost say I do not encounter it, that is, *very rarely*, except as a concomitant of some error of refraction.

CASE 4. Mr. S., book-keeper, æt. 26 years. Has since childhood had an annoying inflammation of the eyelids

(blepharitis marginalis), and now it has grown so severe, unless he gets relief he fears he will lose his position. Vis. R. and L. $^{20}/_{XXX}$. Greatly objects to the use of, or even trial of glasses, but finally submits to the test. Under atropia R. and L. $= {^{20}/_{LXX}}$. R. w. $+ {^{1}/_{30}} \supset$ cyl. $+ {^{1}/_{60}}$ ax. 90° $^{20}/_{XX}$. L. w. $+ {^{1}/_{24}}$ $\supset$ cyl. $+ {^{1}/_{72}}$ ax. $90° = {^{20}/_{XX}}$. I had great difficulty for two months to persuade him to persist in the use of the glasses for all near work, but he finally became a thorough believer. He is now perfectly delighted with his glasses, and says that but for them he knows he would have lost his place. His vision now with glasses at distance is $^{20}/_{XX}$, though of course he only needs them for close use.

CASE 5. Miss W. æt. 18. years. In perfect health, though she frequently and severely suffers with headaches, especially whenever she engages in drawing or painting. Vision normal, ($^{20}/_{XX}$). With atropia R. $^{20}/_{C}$, L. $^{20}/_{LXX}$. R. w. $+ {^{1}/_{24}}$ and L. w. $+$ $^{1}/_{30}$, vis.$= {^{20}/_{XX}}$. She wrote me recently that her glasses had effected a perfect cure of her trouble. She had no trouble in using them from the first.

We must not overlook the fact that though there may be normal or even more than normal acuteness of vision, yet there may co-exist serious errors of refraction which, in order to see clearly for close distance, the patient must overcome by exerting to an abnormal degree his muscle of accommodation. I myself—as will be shown further on—while my vision was always $^{20}/_{XV}$, am by no means blessed with emmetropic eyes.

CASE 6. Miss McK. æt. 18 or 20 years, music teacher. Came to me to be treated for granulated lids, which she said her oculist where she had formerly lived, had nearly cured by several months' treatment. He had not tested her refraction. She says she knows she is near-sighted, as indeed she really appears to be. She just wished her lids treated. She has no idea of using glasses. As I can find no trouble of the eyelids, it appears to me as if she is suffering from ciliary spasm. After a while she consents to a test of her refraction. Under atropia her vision is R. $^{20}/_{L}$, L. $^{20}/_{LXX}$, R. and L. w. $+$ $^{1}/_{48} = {^{20}/_{XX}}$. The use of these glasses soon gave her great relief, and as she expresses it, "they are her best friends."

Case 7. I will show the importance of using a mydriatic in anything like peculiar cases of presbyopia. Mrs. W., æt. 48 years has "had trouble all her life with her eyes." She has never found any satisfactory glasses; vision, R. and L., $^{20}/_{XL}$, with atropia $R=^{20}/_{L}$, $L=^{20}/_{LXX}$, with $+^{1}/_{30}$, $R=^{20}/_{XV}$, $L=^{20}/_{XXX}$. Her presbyopia is $^{1}/_{20}$, and this added to her total hypermetropia $(+^{1}/_{30})=^{1}/_{12}$. With $+\ ^{1}/_{12}$ glass she reads and sews in comfort; at her age, she of course supposed she would not need a $+12$ glass, and was very much surprised when I ordered it for her.

Case 8. shows how an uncorrected error of refraction may entail serious intra ocular disease if not promptly attended to. Mr. L., æt. 32 years, (banker) is very closely occupied in his counting-room. He came to me last January with a very serious and most obstinate iritis, especially in the right eye. Large masses of lymph in the aqueous and vitreous. Vision, $R.=^{20}/_{CC}$, $L=^{20}/_{XXX}$. Accepts—glass, but, of course, no special test of refraction was attempted. After a five months' tedious case of iritis he was discharged as cured. When carefully tested his vision, under atropia, was R. $^{20}/_{LXX}$, L. $^{20}/_{C}$, R. and L. w.$+\ ^{1}/_{30}=^{20}/_{XV}$. For prudential reasons I did not give him the fully correcting glass, but ordered a $+\ ^{1}/_{36}$. With their use he has fully resumed his duties, and I have just had a letter stating that he considered himself fully relieved. In this case there was absolutely no other cause for his iritis than his uncorrected error of refraction.

Case 9. Mr. C. (book-keeper), æt. 28 years, has had for two or three years a very troublesome conjunctivitis, and thinks of giving up his occupation. Refuses, however, to consent to the mydriatic, and goes home. In two months' time he returns and a test is made. His vision is, R. and L. $^{20}/_{XX}$; with atropia, R. and L. $^{20}/_{XXX}$, with $+\ ^{1}/_{60}$, R. and $L=^{20}/_{XV}$. It is remarkable but true, that this slight error of refraction caused all his trouble. With these $+\ ^{1}/_{60}$ glasses he was almost immediately relieved of all his unpleasant symptoms.

Case 10. Miss R. æt. 17 years. Three years ago I operated upon both internal recti for a strabismus of over three lines.

The operation was successful. She had not been able to use her eyes at study to amount to anything. Her vision was R. $^{20}/_{CC}$, L. $^{20}/_{XL}$. Under atropia, w. + $^{1}/_{18}$, R.=$^{20}/_{L}$. Under atropia, w. + $^{1}/_{24}$, L.=$^{20}/_{XX}$. March 14th, last, I saw her and found her vision with glasses was the same as it was three years ago, and in spite of her amblyopia, she gets along very comfortably, with a moderate amount of study. She gets most comfort from the *constant* use of her glasses.

Usually in young persons with strabismus, there is of course hypermetropia, and the surgeon who simply operates for cross-eyes does not do his whole duty if he neglects to fit, or advise the correction of the error of refraction.

I think these three final cases should convince us of the impossibility of surely showing up the real error without the use of a mydriatic.

CASE 11. Mrs. R., æt. 25 years. Has had great trouble for several months with her eyes, aching of the balls, and inability to read or sew. Vision R. and L. $^{20}/_{XX}$. With atropia, R. and L. $^{20}/_{CC}$. It took three careful sittings of over an hour each to find the proper correction. At the first she accepted a + $^{1}/_{18}$ glass, and appeared as if not astigmatic. But at the third one it was clear that the proper glass was R. w. + $^{1}/_{24}$ $\supset$ cyl. + $^{1}/_{72}$ ax. 90°=$^{20}/_{XX}$. L. w. + $^{1}/_{24}$ $\supset$ cyl. + $^{1}/_{48}$ ax. 90°= $^{20}/_{XX}$. These glasses while they worried her at first, soon relieved her of her trouble.

CASE 12. Mr. W. æt. 28 years, theological student. Is trying to use a + $^{1}/_{36}$ glass, which was prescribed for him by an eye specialist two years ago, but he is confident his glasses are wrong. Is unable to study with any degree of comfort. Vision R. $^{20}/_{XX}$, L. $^{20}/_{XXX}$. With atropia, R. and L. $^{20}/_{XL}$. R. w. + $^{1}/_{72}$ $\supset$ —cyl. $^{1}/_{72}$ ax. 30°=$^{20}/_{XX}$. L. w. + $^{1}/_{48}$ $\supset$ —cyl. $^{1}/_{72}$ ax. 70°=$^{20}/_{XX}$. These glasses have given him entire relief.

As to my own case, I had suffered for years with my eyes. More or less constant conjunctivitis, and severe headaches upon close use of my eyes. Ophthalmoscopic work had become especially trying. Even when at the theatre, or when I visited picture galleries, I would generally come away with severe

headaches. I wished to feel that I was not ametropic, and supposed that my trouble was due to my rather delicate general health, close study, etc.

Two distinguished oculists had examined my eyes (my vision was $^{20}/_{xv}$ easy). One of them told me that I was emmetropic and needed no glasses. The other told me I was hypermetropic and advised me to use a $+\ ^1/_{60}$ or a $+\ ^1/_{48}$ glass for close use. Faithful trial of both these glasses did me no good. Finally I saw that something must be done. I had gotten so I could not read a newspaper through, and I did not dare to read at night. As the former test of my eyes had not been made under atropia I thoroughly atropinized one eye one week and the other the next week. By this means I could carry on my work with one eye. Under atropine, R. and L= $^{20}/_{c}$. R. and L. w. $+\ ^1/_{48} \supset$ cyl. $+\ ^1/_{48}$, axis $90° = {}^{20}/_{xv}$.

I also had a pair of cylindrical $+\ ^1/_{48}$, axis 90°, made for occasional use at distance. I frequently find these latter very beneficial to rest my eyes.

As to my fully correcting compound glasses, they are almost a revelation to me. I am quite sure that no one who has emmetropic eyes can appreciate the extreme degree of comfort which they have given me. I am astonished—indeed I may say almost uneasy—at the amount of extra use to which I frequently put my eyes now. At first my fully correcting glasses gave me great trouble. They would cause a most unpleasant giddiness and, very frequently, aching in the temples, but by persisting in their use until I gradually became accustomed to relaxing my over-accommodation, they soon gave me, as I said, great comfort. While I only use them for close work, my vision is with them now $^{20}/_{x}$ easy.

In regard to the more recent (and very expensive) mydriatic, homatropine, the effect of which is so much more evanescent upon the accommodation than atropia, my experience is yet so recent with it that I am not prepared to give an opinion concerning it. Usually I have found that after its full effect the accommodation is restored in thirty-six to forty-eight hours. It is almost amusing to note the difference in opinion

as to its value, held by various eye surgeons. Recently two distinguished oculists, each surgeon to large eye hospitals in two different cities North, gave me their opinion of it. One claimed that it only partially paralyzed the accommodation and that he had abandoned its use. The other said it fully paralyzed the accommodation and that he used nothing else in refraction work. At the present writing my experience is that it does not generally *fully* paralyze the accommodation.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, JUNE 13, 1889.

J. W. HULKE, F. R. S., President in the Chair.

ON THE APPARENT MOVEMENT OF OBJECTS ASSOCIATED WITH GIDDINESS.—Dr. Beevor read this paper, and began by defining giddiness as: (1) the apparent movement of objects in definite directions; (2) the sensation of the person himself moving round, and (3) both sensations combined. In certain cases of epilepsy giddiness had been observed as an aura, and in the large majority of these cases, the apparent movement of the patient and of objects round him were in the same direction and generally corresponded to the direction of initial rotation of the head in the fit. In auditory vertigo, in most cases, the apparent movement of the patient was in the opposite direction to that of objects round him. With the actual movement of objects before the eyes giddiness was produced, as in the case of a waterfall, but only that part of the retina perceived secondary after-movements which was acted on by the image of the falling body; the after-movements were always in the opposite direction to the real movements. If the eyes were fixed, giddiness was not produced, but the secondary after-movements were, and the author thought it highly probable that the latter could be produced by a complementary sensation of movement in the rods and cones of the retina which had become exhausted by the continued movement.

Dr Collins said that Dr. Beevor's views were in opposition to those taught by Helmholtz and all other writers up to the present date.

Mr. Silcock inquired as to the duration of the after-sensations, observed by the author after looking at falling water.

Dr. Beevor in reply said that while he did not deny the correctness of Helmholtz's views, he was unable to explain thereby how a strip of the retina only could be affected by after-movements and not the whole field of vision. Helmholtz stated that if the eyes were fixed no giddiness was produced by the appearance of moving objects, but this did not tally with Professor Thompson's experiments with two oppositely rotating discs, to which Dr. Beevor referred.

On Some Forms of Traumatic Keratalgia.—Dr. Bronner (Bradford) read a paper on this subject, and reminded the Society that Dr. Grandclément had drawn attention to the affection at the Ophthalmological Congress in Paris in 1888. The peculiar feature of these cases was the severe pain resulting from a very small wound of the cornea, which pain recurred usually in the mornings, often for several months. He read notes of some cases, in one of which the pain lasted for eight months, and was so intense that the patient wished to have the eye removed. Relief was obtained by excision of a small macula at the site of the wound. In another patient the pain continued for two years. The author suggested, as treatment for these cases, the use of hot fomentation for several weeks, followed by massage with yellow oxide of mercury ointment. If these remedies failed, the excision of any cicatrix resulting from the wound should be tried.

Mr. Bailey suggested that the cases might be in a measure hysterical, though the presence of a corneal cicatrix showed that some structural change had occurred.

The President remarked that the pain and other symptoms were frequently more severe in superficial injuries of the cornea than in deep wounds, possibly because in the former case a large number of the extreme terminations of the nerves were lacerated. In most cases where there was removal of epithelium, if the eyeball were fixed, the epithelium rapidly reformed, but in a few the pain persisted apparently after the wound had healed.

Dr. Collins thought all the cases of superficial injury to the cornea got well if treated with rest and atropine.

Mr. Jonathan Hutchinson, Jr., referred to Dr. Bronner's suggestion that a chemical irritant might be present, and mentioned the case of a boy who injured his eye with a steel pen nib and ink-stained the cornea. Pain persisted for a long time in spite of careful treatment.

Mr. Nettleship thought the Society was indebted to Dr. Bronner for calling attention to these cases. He had long been familiar with cases in which a simple abrasion of the cornea appeared to relapse after a considerable interval of time, and suggested that in these instances the epithelium had not undergone vigorous repair, and the scar easily broke down again. He asked Dr. Bronner if the destruction of the macula on the cornea by means of the galvano-cautery might not be as efficacious as excision of the scar.

Penetrating Wound of the Globe, with Eyelash in the Anterior Chamber.—Dr. Collins read notes of this case, occurring in a man æt. 44 years. The injury was caused by a knife thrust. A sclero-corneal wound resulted, with prolapse of iris; and when the patient was first seen, forty-eight hours after the accident, a cilium was observed lying on the anterior surface of the iris; this was removed without difficulty with a Tyrrell's hook and iridectomy forceps. Rapid recovery ensued, and a month later $V = {}^{5}/_{XII}$ and J. 1 with correction. Three similar cases had been recorded by Messrs. Rockliffe, Power and Couper.

On the Light in Optic Neuritis.—Mr. Berry (Edinburgh) communicated this paper, which was read by the Secretary. Four cases of double optic neuritis from cerebral disease had been examined. In all the acuity of vision was normal, and when tested with Bjerrum's types no light-difference defect was discovered, although the changes seen at the optic papillæ were very pronounced. This fact established a distinction between cases of ordinary optic neuritis and of retro-bulbar neuritis, which was suggestive of different alterations in the nerves in the two diseases.

On a Case of Subconjunctival Cysticercus.—Mr. Gunn for Mr. Werner (Dublin) read notes and exhibited drawings of this case. The patient was a lad æt. 7 years, and on depressing his right lower lid a smooth ovoid semi-translucent cyst was exposed, the size of a large pea and of a reddish yellow colour. It was situated between the sclera and conjunctiva and was freely movable under the latter. When examined by focal light a small opaque circular spot was visible, near the centre of its anterior surface which cast a shadow in the interior of the cyst. After removal, which was accomplished without difficulty, the microscope revealed in the interior of the sac the head and neck of a bladder-worm, with four suckers and a circle of thirty hooklets, large and small, to which succeeded a much-wrinkled neck, sprinkled over with the usual calcareous corpuscular particles. Measurement of the hooklets and the appearance of the wallsof the vesicle proved the parasite to be cysticercus cellulosæ, the cystic stage of tænia solium.—(*British Medical Journal.*)

REPORT OF THE 25th ANNUAL MEETING OF THE AMERICAN OPHTHALMOLOGICAL SOCIETY.

Held at the Pequot House, New London, Conn., July 17 and 18, 1889.

Wednesday.—Morning Session.

The Society was called to order by the President, Dr. Wm. F. Norris of Philadelphia.

The first paper read was:

An Analysis of Ninety Cases of Simple Chronic Glaucoma with Special Reference to the Effects of Iridectomy upon the Acuity of Vision and the Visual Field.—By Dr. Charles Steadman Bull, New York.

Detailed histories of the ninety cases were presented and the following conclusions formulated:

In endeavering to draw some rational conclusions from the study of ninty cases, it seem wise to begin with a quotation from Priestly Smith, to whom ophthalmologists owe so much of their knowledge of the pathogeny and pathology of glaucoma,

1. In considering the expediency of an operation in chronic glaucoma, he says: "In every case of chronic glaucoma, the responsibility of advising an operation is a heavy one and should on no account be undertaken without a full explanation to the patient or his friends of the almost positive certainty of blindness on the one hand and of the uncertainty which beset the operation on the other. Having regard to the age of the patient, the impossibility of great benefit and the possibility of a painful and accelerated progress, the prudent surgeon will only operate on the express desire of the patient to receive the only possible chance of benefit, however small it may be." Armed with the preceeding precaution, it seems to be our duty to operate in cases of chronic progressive glaucoma, and the earlier the better.

2. If the disease in a given case seems to be stationary and is still in the primary stage and if it be possible to test the vision and visual field at short intervals, delay in operating is permissible, but a weak solution of eserine or pilocarpine shall be used daily, merely as an aid in controlling the course of the disease. The examination of these patients should be at short intervals and should invariably include tests for visual acuity and the careful examination of the visual field.

3. If the disease exists in both eyes but with useful vision in both eyes, the eye in which the disease is the more advanced should be operated on without delay; and the surgeon will be guided in his treatment of the fellow eye by the result of the operation on the first eye.

4. To insure the best result, the incision should be made well in the sclerotic with a narrow cataract knife or a broad lance knife, and the entire iris, from one end of the incision to the other, should be carefully torn or excised from its insertion.

5. The most carefully performed iridectomy by skillful

hands is sometimes followed by rapid loss of what sight still remains, sometimes partial, but unfortunately sometimes total.

6. A successful result is in the majority of cases more likely to follow the operation if it is performed early in the course of the disease, but the maintenance of the existing degree of vision even in these cases is not invariable.

7. As regards the question of symmetry, it is probable that in the large majority of cases, probably as much as 80%, the disease is sooner or later present in both eyes, and a careful study of the cases seems to establish the fact that there can be no specific interval of time which ensures the second eye against an attack.

8. If the patient is old and feeble and one eye is still free from disease for a year or more after the other eye has become affected, it may be considered prudent to avoid an operation on the affected eye; as it is probable that the unaffected eye may remain free during the remainder of the patient's life.

9. The condition of the field of vision is no constant guide either in forming a prognosis as to the progress of the disease or in deciding as to the time of operation.

10. The acuity of vision bears no constant relation to either the success or failure of the operation.

11. The anterior chamber is usually shallow, is occasionally entirely absent, but is often apparently normal in depth. The condition of the chamber gives no reliable hint as to the state of the vision or the visual field nor any indication as to prognosis.

12. The appearance and motility of the iris appear to have some bearing upon the prognosis, though perhaps not to the extent believed by Nettleship. The latter states that in the cases in which the iris reacts rapidly to eserine the operation proves successful. This has not always been the experience of the reporter, but in the majority of the cases in which eserine caused rapid contraction of the pupil, the visual acuity was fairly good and the field was not seriously limited.

13. The depth of the excavation in and the color of the optic disc seem to have no close connection with the defective

vision or with the limitation of the visual field, nor did they offer any constant guide as to prognosis or to tne effect of an operation upon the progress of the disease.

14. The condition of the intra-ocular tension is a very uncertain guide in deciding the time for operating. It may be normal or increased or even diminished. It does not even seem to bear any constant relation to the degree of usual acuity or to the state of the visual field. The steady maintenance of the increased tension, however, without any diminution, almost invariably indicates the necessity for an immediate operation, and this necessity is especially indicated if the tension is continually on the increase.

15. The health and age of the patient exert a decided influence upon the effect of the operation. Any marked evidence of senility is distinctly unfavorable to operation.

DISCUSSION.

Dr. H. Knapp, New York.—During the past nineteen years I have operated on 670 cases of glaucoma, 226 of which were cases of chronic glaucoma. I think that the prognosis may be a little more favorable than has been indicated by Dr. Bull. I have had four cases in which malignant disease followed operation for chronic glaucoma. I do not agree with the author as to the advisability of the continued use of pilocarpine or eserine in those chronic cases were operation seems doubtful. I advise its use when there are recurrent symptoms. In prognosis I am guided a great deal by the condition of the iris. My operations have been done with the lance-shaped knife. I consider it of great importance to carefully reduce the edges of the coloboma, not only by external pressure but also by the use of the blunt probe. I am also careful not to make the operation too peripheric. Peripheric wounds are more liable to cystoid scars.

Iridectomy in Glaucoma.—By Dr. Emil Gruening, New York.

The speaker classified the different forms of glaucoma under the following heads:

1. Acute inflammatory.

2. Chronic inflammatory without visible degenerative changes in the iris.

3. Chronic inflammatory glaucoma with visible degenerative changes in the iris.

4. Simple glaucoma.

5. Intermittent glaucoma. He described cases illustrative of these different varieties.

DISCUSSION.

DR. S. O. RICHEY, Washington.—I do not believe simple chronic glaucoma to be entirely a local affection. I think that it is a local expression of a cause to be looked for in the nervous system. I have used eserine with satisfaction in the early stages but support it by galvanism applied to the cervical ganglia. In some cases this will enable us to avoid operation.

DR. SAMUEL THEOBALD, Baltimore.—I have met with one case in which an attack of pronounced acute glaucoma was cut short by the use of eserine.

DR. C. S. BULL, New York.—Eserine is frequently used in too strong solution. A solution of half a grain to the ounce may cause iritis after a single instillation. I never use a stronger solution than this. I often use one as weak as one-tenth of a grain to the ounce.

DR. B. ALEX. RANDALL, Philadelphia.—I can confirm the remarks in regard to the value of weak solutions. In one case of serious absolute glaucoma a solution of $^1/_8$ grain to the ounce was entirely successful in relieving the pain. It has been used steadily for three years with no recurrence of the severe symptoms and without the intervention of any inflammatory trouble.

DR. S. D. RISLEY, Philadelphia.—In experimenting with weak solutions of eserine I have found that a distinct effect was experienced from a solution as weak as one-thirteenth of a grain to the ounce. If this was applied three times a day, it would in two days cause distinct brow-ache. I have seen benefit from weak solutions when stronger solutions failed to give relief.

Dr. Henry D. Noyes, New York.—One point to which my attention was called many years ago is that in certain instances of evident glaucoma with a large amount of refractive error, it has seemed that the aggravation of the glaucomatous disease has been dependent upon the accommodative strain. In operating I have gradually withdrawn from the extremely peripheral plan of incision. I prefer to come closer to the border of the cornea than some do. This involves less risk and is easier of performance.

Dr. Samuel Theobald, Baltimore.—My experience tends to convince me that astigmatism and particularly astigmatism against the rule, is frequently the cause of glaucoma.

Dr. Arthur Mathewson, Brooklyn.—In one case of glaucoma in which iridectomy had been done without arresting the progress of the disease a large injection of strychnia caused a decided improvement of vision which continued. I have used it in other cases with good effect.

The Use of the Currette in Trachomatous Pannus.—By Dr. Emil Gruening, New York.—

The speaker after referring to the various measures proposed for the relief of this condition, described an operation which he had employed in eleven eyes during the past two years. A 6% solution of cocaine was first instilled. The surface of the cornea and the vessels present were then scraped away with a gouge shaped instrument and the vessels followed well on to the conjunctiva. The eye is then washed with boric acid solution and warm compresses applied for four or five days. In three cases new vessels formed and the operation was repeated. The ultimate result in all the cases was highly satisfactory. In old and protracted pannus, this operation may be recommended for its directness, simplicity and efficacy.

DISCUSSION.

Dr. S. B. St. John, Hartford.—I have used this operation in one case with the highly gratifying result of increasing the vision from $^{4}/_{cc}$ to $^{16}/_{cc}$. This has since still further improved.

DR. H. F. HANSELL, of Philadelphia, read a paper on:

CORNEAL ABSCESS.

Describing its symptoms and referring to the differential diagnosis between it and ulcer, he protested against the use of cocaine in abscess or other inflammatory conditions of the cornea. A few drops of a strong solution will often destroy the epithelium. Instillation of eserine alternating atropine was recommended. Operative interference should be limited to evacuation of the pus.

FURTHER OBSERVATIONS ON MALARIAL KERATITIS.—By Dr. Chas. J. Kipp, Newark, N. J.

The author had called attention to this condition in a paper read before the society in 1880. He had seen 120 cases of the disease. In all there had been paroxysms of malarial fever and in 90% the corneal inflammation followed a few days after a paroxysm. In 25% the patients had suffered from similar trouble in nervous attacks of malaria. The inflammation of the cornea occurred in the form of serpiginous ulceration, with narrow prolongations. The trouble began on a line of small grayish elevations, which soon broke down, forming a furrow of ulceration. In mild cases the duration is two or three days, while in severe cases it may last several months. There is a marked tendency to recurrence in subsequent attacks of malarial fever. In a few cases he had seen a similar affection in non-malarial individuals. The treatment consists in remedies directed to the general condition and in mild cases with warm fomentation. In severe cases a 1% or 2% solution of nitrate of silver applied directly to the furrows after the use of cocaine answers well. In some very severe cases the actual cautery was employed. This arrested the progress of the disease and stopped the pain, provided the malarial trouble had previously been cured.

DISCUSSION.

DR. HENRY D. NOYES, New York.—During the past 15 or

20 years I have met with cases of superficial keratitis due to malaria. It is rare to find the deeper tissues invaded. I am led to suspect a malarial origin in cases where there is exaggerated tenderness of the supro-orbital nerve and distinct anæsthesia of the surface of the cornea. The form of ulcerative keratitis which has been described I regard as of mycotic origin and have cured it by scraping thoroughly the lines of infiltration.

Dr. T. Y. Sutphen, Newark.—I have seen cases similar to those described by Dr. Kipp in patients suffering with malaria, and where there has been no distinct chill, the individuals have resided in malarious districts.

Dr. John Green, St. Louis.—I have seen many cases in which malarial fever was followed by superficial keratitis or keratitis modified by neglect or improper treatment. I have not met with the form described by Dr. Kipp.

Dr. Emil Gruening, New York.—I have seen this form of ulcerative keratitis, but I have associated it with the teeth. These patients have had tartar on the teeth and have been in the habit of moistening the lids with saliva. I think therefore that the source of infection is in the mouth.

Dr. Samuel Theobald, Baltimore.—I have also seen for many years this keratitis associated with malarial trouble. These cases do not always show ulceration of the cornea. I have in a general way regarded this condition as analogous to herpes zoster. I have once or twice seen iritis associated with the keratitis following malaria. In one case of malaria I have seen this keratitis with herpes zoster of the temple.

Irrigation of The Anterior Chamber.—By Dr. J. A. Lippincott, Pittsburg.

This procedure is useful for the removal of debris in cataract extraction and of clotted or liquid blood. In order to accomplish this successfully it is necessary to have an apparatus which can be readily made and kept aseptic; which will always be ready for use; which can be easily handled and the movement controlled with one hand; whose ejecting force is

capable of being easily regulated; and which is free from liability of forcing air bubbles into the anterior chamber. As fulfilling these requirements he exhibited an apparatus consisting of a small metal receptacle with which was connected a rubber tube ending in a metal nozzle, the flow of liquid being controlled by a short piston in a rubber handle through which the rubber tube passed. The ejecting force can be varied by elevating or lowering the receptacle.

Dr. E. Gruening, New York, exhibited a small flask devised by Græfe for the same purpose.

Dr. David Webster, New York, exhibited

Two Specimens of Sword Fish's Eyes.

Dr. Henry D. Noyes, New York, exhibited

A Spectacle Frame,

in which the nose piece of the eye glass was combined with the ordinary spectacle frame.

Enucleation of the Eye in Pan-Ophthalmitis.—By Dr. Henry D. Noyes, New York.

There have been reported by various observers 30 or 40 deaths following enucleation, almost all from meningitis. About one-half of the fatal cases have occurred after enucleation during acute suppurative pan-ophthalmitis. At the New York Eye and Ear Infirmary there have been no deaths from this cause, when no additional operation in the orbit, such as the removal of tumors, etc., has been done. The number of enucleations from 1868 to 1888 was 1164; the number of eviscerations 17. Panophthalmitis existed in 14% of the cases. It seems fair to conclude that while a small risk to life is incurred by enucleation of the eye, the supposed increased risk by the existence of suppurative panophthalmitis is not so far justified by the facts as to bar its performance in this condition. Adjourned.

Afternoon Session.

The Treatment of Caries and Necrosis of the Orbit.—By Dr. H. Knapp, New York.

The upper wall of the orbit is the most frequent seat of dis-

ease and here its consequences are most dangerous. In every case of caries and necrosis of the orbit the condition of the neighboring cavities, and especially the nose, should be carefully investigated. Foci of suppuration should be freely opened, the cavity thoroughly cleansed and drainage established. This can be well accomplished by small silver tubes provided with flanges. Rough bone should be scraped away with a sharp spoon. Necrosed portions of the bone should be removed as soon as they become loose or when they can be detached without injury to adjacent tissues. The eye-ball should be protected and if there is insufficient closure of the lids, a plastic operation should not be postponed until the cornea becomes ulcerated from exposure.

Multiple Cysts of the Iris Occurring in Both Eyes.—By Dr. H. W. Williams, Boston.

The subject was a girl æt. 9 years. In the right eye was a projection resembling a large cyst extending from the upper margin of the pupil. A similar growth projected from the temporal border. At the inner part there were two small pedunculated growths. All were of the color of the iris. In the left eye, two somewhat oval cysts filled the pupillary space. Through the square opening left in each pupil there was a little oblique vision.

Sarcoma of the Optic Nerve.—By Dr. T. Y. Sutphen, Newark.

The patient was æt. 10 years. The tumor involved the left orbit and was of two years duration. It was of a mushroom shape and sprang from the optic nerve. Its size was 6 in. by 5 1-4 in. and 2 inches thick. It was readily removed with curved scissors. As much as possible of the nerve was removed.

Extensive Vascular Growth in the Vitreous.—By Dr. George C. Harlan, Philadelphia.

The patient, a woman æt. 50 years, presented herself Novem-

ber 28, 1888, on account of disturbance of vision. Examination of the right eye showed the fundus to be slightly hazy, with small dull white spots about the macula, the remains of old hæmorrhages, but no recent exudation. The disc was obscured by a delicate network of vessels. Otherwise there was no opacity. There was no stroma. Up to March 2, 1889, there had been several retinal hæmorrhages, but there had been no change in the vascular membrane. Vision had been reduced to $^{20}/_{\text{LXX}}$.

Extraction from the Vitreous of Pieces of Steel by the Magnet.—By Dr. O. F. Wadsworth, Boston.

The author described two cases in which the piece of steel was removed by passing an electro-magnet into the vitreous through an opening in the sclera. In the second case, the operation was followed some weeks later by a separation of the retina, beginning at a point opposite that at which the puncture was made.

Corneal Transplantation.—By Dr. J. O. Tansley, New York.

The speaker reported a case in which he had done this operation for opacity of the cornea. At the first operation the opacity was not removed to its full depth and although the cornea cleared to a certain extent, the result was not satisfactory. The operation was therefore repeated, but without any improvement in vision. In both operations there was primary union of the graft and in neither was there any inflammatory reaction.

DISCUSSION.

Dr. L. Webster Fox, Philadelphia.—I have performed the same operation in a case of opacity of the cornea when the patient could just distinguish light from darkness. The graft healed readily without inflammatory reaction and the patient obtained useful vision and could almost count fingers.

An Analysis of Some of the Ocular Symptoms Observed in So-called General Paresis.—By Dr. Chas. A. Oliver, Philadelphia.

These observations were made on 20 well-marked cases of general paralysis of the insane. The study was limited to subjects in the so-called second stage of the disease, where the psychical symptoms become of such a character as to necessitate control and where motor and sensory derangement had become more or less manifest. Care was taken that each subject was seemingly free from any extraneous general disease or local disorder and the entire study was limited to the male sex, so as to escape any conflicting and complicating changes that might appear in connection with the many diseases peculiar to the female sex. Thirty observations were made, resulting in the following summary:

1. The sensory changes herein described, which have been limited to unequal optic nerve degeneration, decrease of retinal circulation, with sub-normal, direct and excentric vision for both form and color, distinctly show lowered sensory response.

2. The motor symptoms, consisting in unequal and feeble movement of the irides, causing inequality and irregularity of pupillary areas, the peculiar form of ataxic nystagmus, the slight loss of ciliary tone, all express want of proper muscle action—true paresis.

3. The peculiarly local conditions shown in the fundus, such as the pigment massings, the crescents of absorption, the disturbed and granular condition of the choroid, etc., all indicate wear and tear of an abused and irritated organ.

4. Therefore these observations upon the ocular apparatus, which were most probably made during the second stage of the disease known as general paralysis of the insane, show not only local changes, but distinctly demonstrate that the series of sensory motor disturbances found are but the peripheral expressions of one of the many indices of gradual loss of neural strength and power in this disease.

Dr. George C. Harlan, Philadelphia, reported a case of

HYSTERICAL BLINDNESS

of ten years duration in a male æt. 22 years.

DR. SAMUEL B. ST. JOHN, Hartford, described a case of

HEMIANOPSIA

with peculiar cerebral symptoms.

DR. B. ALEX. RANDALL read a paper on

SIMPLE TESTS OF THE OCULAR MUSCLES.

A CASE OF DOUBLE PURULENT CHOROIDITIS RESULTING FROM MENINGITIS.—By Dr. T. Y. Sutphen, N. J.

February 23, 1887, I was called in consultation to see G. W. B., a robust farmer, æt. 39 years. He had always been healthy, with the exception of an occasional "billious headache." Never had had any specific trouble. The history was that on February 9 he came in at noon perspiring very freely. That evening he suffered with intense headache. The next morning he was apparently well, but at breakfast had a violent chill with aching of the whole body. This was followed by high fever. Leaving the breakfast table was the last that the man remembered for three months. From this time the patient rolled and tossed in bed without decided delirium, but being in a stupid condition and easily restrained. Questions were answered only after frequent repetition and the replies ran into complete incoherence. On the third day of the illness the body became quite rigid with the head thrown backwards. On the fourth day, the left hand and forearm became swollen and the right eye inflamed. The left eye became inflamed on the tenth day. Later the left foot became swollen. The swelling of the hands and foot lasted about a week and then subsided. The fever then became less violent and the general condition improved, but the mental sluggishness remained. There was no paralysis, no convulsion, no vomiting. At the end of the third week he had a slight chill and another after he was out of bed.

At present the man is apparently in good health. He has lost none of his functions and the mind is perfectly clear. When first seen by the writer the eyes were in the following

condition: No swelling of the lids; moderate pericorneal injection; cornea clear; anterior chamber normal in depth; irides slightly discolored; pupils moderately dilated, with a yellowish reflex from the anterior portion of the vitreous. There was no perception of light; no tenderness on pressure, but a marked lessening of the tension of the globe. Three days later, the anterior chamber in each eye was obliterated by pressure from behind the lens; the eye-balls being harder than normal. One week later, the anterior chamber was again restored and tension had again fallen much below the normal. From that time on there was progressive atrophy of both eyes, until now there is left only the greatly shrunken globes, with of course absolute blindness.

In this case there must have been an extension of the intracranial inflammation along the sheath of the nerves and not a forcing of the products of inflammation forwards, as sufficient pressure within the cranium to produce this must evidently have become apparent by more or less paralysis.

The case is reported simply as a clinical contribution to this somewhat rare and obscure trouble which is certain to be met with in the course of practice. Adjourned.

THURSDAY.—MORNING SESSION.

CONTRIBUTIONS TO THE SUBJECT OF TUMORS OF THE ORBIT AND NEIGHBORING CAVITIES.—By Dr. C. S. Bull, New York.

CASE 1—was an adeno-sarcoma of the lachrymal gland. It was operated on two years ago. There has been no return.

CASE 2—was one of abscess of the ethmoid cells, frontal sinus and orbit in a male æt. 46 years. It was opened, washed out, and drained. There was perfect healing.

CASE 3.—Tumor of the maxillary antrum, nasal fossa, ethmoid cells, orbit and cranial cavity. The eye was enucleated; the maxillary antrum cleaned out. A large opening was found through the orbit into the anterior fossa of the skull and through this the tumor extended. The evening following the operation the patient became comatose, and died the next morning.

DISCUSSION.

Dr. H. Knapp, New York.—The report of these cases shows the necessity of early operation in all cases of tumors of the orbit or near the orbit.

Dr. B. A. Reeve, Toronto.—In a number of these cases of empyema of the frontal sinus I have found hypertrophy of the middle turbinated bone. This is a point of importance in etiology and prophylaxis.

[to be continued].

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THE EMPLOYMENT OF OLEATE OF VERATRIA TO FACILITATE THE DETERMINATION OF ERRORS OF REFRACTION.[1]

BY SAMUEL THEOBALD, M. D.

Surgeon to the Baltimore Eye, Ear and Throat Charity Hospital; Ophthalmic and Aural Surgeon to the Johns Hopkins Hospital Dispensary.

If the use of a mydriatic eliminated all the difficulties and uncertainties which frequently attend the determination of the more complicated forms of ametropia, we would unquestionably be justified in paralyzing the accommodation in every such case, notwithstanding the temporary inconvenience which the patient experiences from this procedure; but, I apprehend, few persons of considerable experience will claim that it really does this. In simple H it enables us, as a rule, without much difficulty to determine the total error of refraction, and in simple M, by eliminating ciliary spasm, it usually gives us a much more trustworthy result than can be otherwise obtained; but in the measurement of astigmatism, the help which we derive from the employment of a mydriatic is, unfortunately,

[1]A paper read before the American Ophthalmological Society July 18, 1889.

by no means so efficient. The total refraction error of the eye, apart from the astigmatism, can undoubtedly be more exactly determined, but the actual amount of astigmatism, in many cases, is as difficult, or as impossible, of ascertainment with the eye under the influence of a mydriatic as with the accommodation in its ordinary state of activity. In a word, *while symmetrical ciliary spasm is usually suppressed and latent hypermetropia rendered manifest by the application of a mydriatic, asymmetrical ciliary spasm and latent astigmatism are but little, if at all, influenced by it.* Indeed, it has seemed to me not infrequently that *the capacity of the eye for what may be termed asymmetrical accommodation is actually greater when it is under the influence of a mydriatic than when it is not.* And this has disposed me to believe *that as in the iris, so in the ciliary muscle, only the circular fibres are paralyzed by the mydriatics that are commonly employed, while the radiating fibres which we may safely assume have most to do with asymmetrical accommodation, like the radiating fibres of the iris, are actually stimulated by them.* However this may be, there can be no doubt that in many cases the wearing of cylindrical glasses renders manifest, after a time, a great deal more astigmatism than can at first be discovered, even by the liberal use of a mydriatic. That the true direction of the meridians of greatest and least refraction can be more accurately ascertained with the accommodation paralyzed than without is, to say the least, problematical; while, on the other hand, it cannot be denied that a widely dilated pupil is an obstacle, and in some instances a serious obstacle, to the exact determination of the refractive condition of the eye as it exists in ordinary vision.

Influenced by these several considerations, I have found myself of late less frequently resorting to mydriatics in my refractive work—especially in the examination of astigmatism—than I previously did. My usual course of procedure is, first, to ascertain, as accurately as I can, the total ametropia by means of the ophthalmoscope; then to measure carefully, by the vertical diplopia test, the relative strength of the external and internal recti muscles at 13″ and at 20′; and, finally, to de-

termine the manifest error of refraction with glasses. If the knowledge of the true refractive state of the eye which I obtain with the ophthalmoscope is less exact than that which can be gained by the use of a mydriatic, it is, at least in many cases, sufficiently exact, when supplemented by the information derived from the muscle test and the trial with glasses, to indicate the character and strength of the spherical glass with which the cylinder should be combined; and this, I believe, is as much as, and sometimes more than, the mydriatic does for us. For example, if, in a case of compound hypermetropic astigmatism, we find, with the error of refraction uncorrected, 2° or 3° of insufficiency of the internal recti muscles at 20′ and 6° or 7° at 13″, it matters very little to us, in most cases, what the *total* hypermetropia may be, since the state of the muscular balance would contra-indicate the correction of any part of that which was latent. So, also, in astigmatism apparently mixed, the discovery of insufficiency of the external recti muscles of appreciable amount would lead us to suspect that the myopic element was not real, but the result of ciliary spasm, and having confirmed this by careful *binocular* testing, as we very often can, we should be kept from the error of prescribing, in such a case, a concave spherical or cylindrical glass, just as would have happened had we employed a mydriatic. Again, in compound myopic astigmatism, with the myopia at all considerable in degree, the absence of relative divergences at 13″ with the vertical diplopia test, would, in the first place, make us suspect that the real myopia was less than the apparent, and in the second place, would prevent our correcting, for near vision, as large a portion of the myopia as we otherwise would have done.

On the other hand, the cases in which it would be unwise to prescribe glasses without first using a mydriatic, are usually fairly well indicated by the tests which I have described. For example, if, in a case of compound hypermetropic astigmatism, in which there is but little manifest hypermetropia, we should find well-marked insufficiency of the external recti muscles at 20′, we would without hesitation resort to the use

of a mydriatic, because we should be warranted in suspecting the existence of a considerable amount of latent hypermetropia, and because, in order to restore the normal muscular balance, we should wish to neutralize a large part of this.

The great difficulty, however, which I experience in dealing with cases of astigmatism—and this difficulty is the same, as has been said, whether a mydriatic be employed or not—is in determining the exact strength of the *cylindrical* glass, not in deciding upon the spherical glass which is to be combined with it. Is the astigmatism discoverable in a given case the total astigmatism of the eye, or is it only that which is manifest, and is there an additional portion rendered latent through the action of the ciliary muscle? Or, on the other hand, is the apparent astigmatism greater (as sometimes happens) than the real? Shall I give the weakest of several cylinders, which according to the line and letter tests, seem to correct the astigmatism equally well, or shall I not? These are the questions that are constantly presenting themselves to my mind. And it is in the endeavor to solve these questions that I believe I have derived some help from the action which I find veratria exerts upon the accommodative apparatus of the eyes. I may add here, also, that my experience has led me to formulate a rule, which, though it is doubtless subject to many exceptions, has been of practical value to me in this same direction. It is as follows: In astigmatism *according to the rule*, we need correct only that which is readily made manifest, first, because in this form of ametropia latent astigmatism is less often met with; second, because, even if the whole defect be not fully rected, the asthenopic symptoms will probably be entirely relieved for an indefinite period; third, because the slightest over-correction of the astigmatism will certainly give rise to serious annoyance. On the other hand, in astigmatism *against the rule*, we are warranted in correcting fully every particle of the defect which we can render manifest, first, because here latent astigmatism is, perhaps, more commonly present than not; second, because unless the defect be fully corrected, the relief which the glasses afford will in all probability be of but short

duration; and, third, because a slight over-correction of the astigmatism is scarcely more likely to prove unacceptable to the eye than an appreciable under-correction.

For some time I have been in the habit of employing oleate of veratria as an application to the forehead and temples for the relief of asthenopia and the headaches which result from accommodative strain, and having found it efficacious in many cases, I was led to prescribe its use in astigmatism, especially, as a preliminary to testing for glasses. It is needless to say that its action is entirely unlike that of belladonna, and that it neither dilates the pupil nor paralyzes the accommodation. What it does appear to do, however, besides rendering the eyes less iritable and asthenopic, is to exert a quieting effect upon the ciliary muscle, influencing especially, it seems to me, the radiating fibres, and thus lessening the tendency to asymmetrical accommodation. It is true that not infrequently the influence which it exerts upon the muscle is inappreciable; but, as a rule, after several daily applications of the veratria the irritability of the muscle is found to be unmistakably lessened, and the determination of the refractive error is accomplished with greater ease to the patient, as well as to the examiner. All who have had experienee in testing cases of astigmatism know what an immense difference there is in the behavior of different eyes under examination. How in one eye the measurements are made with the greatest facility, and the selection of the proper cylinder is attended with no difficulty whatever; while, in another, the skill and patience of the examiner are exhausted in an effort to reach even an approximation to a definite conclusion. It would be too much to claim for the veratria that it makes the latter class like the former; but, its action will be understood at once when I say that the effect which it produces is, at least, an approach to this.

The veratria is most conveniently used in the form of an oleate, which I have always prescribed in the strength of 10%. It need be applied but once a day (in the morning, after washing, is the best time), and but a small quantity (as much as can be gotten upon the finger-tip by twice touching it to the mouth

of the tilted vial) should be rubbed upon the forehead and temples. It is necessary to caution patients to wash their hands after making the application, and to be careful not to transfer the veratria with their hands, handkerchief or towel from the forehead to the eyes, as it causes very persistent irritation if it finds its way into the conjunctival sac. It is also well in applying it to the temples not to put it near the outer angle of the lids, as it seems to spread over the skin, and may find its way in this manner into the eye. As a rule, the burning and tingling sensation which it produces upon the forehead and temples is not unpleasantly severe, but in some cases complaint is made of it. After its use has been continued for a while the skin becomes very much less sensitive to its action, and to increase the effect it may be necessary to rub the forehead with a rough towel before applying it. When time permits, the veratria should be applied every morning for three or four days before the test of the refraction is undertaken; and, after the glasses have been prescribed, its use from time to time will be found decidedly efficacious in relieving any lingering traces of asthenopia.

NEEDLESS AND ANNOYING RESTRAINTS IN EYE SURGERY.[1]

BY JULIAN J. CHISOLM, M. D.,

Professor of Eye and Ear Diseases in the University of Maryland, and Surgeon-in-Chief of the Presbyterian Eye, Ear and Throat Charity Hospital of Baltimore.

The successful surgery of the day depends largely upon the care bestowed in the carrying out of details. Many things, little, in appearance, but really essential, make up the summary of successful treatment. While this applies to all surgery, it embraces eye surgery as well. The successes of to-day, which make operations upon the eye the most perfect of all surgical practice, are brought about by the great care bestowed in the preparations for the operation, the manual for its performance, and the after-treatment.

In eye surgery smooth operations cover at least 75 % towards successes, so that the bad results can be partly laid to traumatism or defective operative procedures. When an eye operation is well done the surgeon may confidently expect good results. To insure this there are certain points upon which all agree. *Cleanliness holds the first place.* Clean instruments, clean hands, clean dressings, clean surroundings, are all of paramount importance, and should be of universal adoption. To obtain the largest per cent of successes in eye surgery no one of these can be omitted. The necessity for asepsis and anti-sepsis are recognized and adopted more or less generally and thoroughly. Our instruments must be kept sharp, as well as clean, or they will not do the nice work required of them. Putting them in boiling water before as well as after operations ensures this

[1]Read in the Section of Ophthalmology of the American Medical Association, at its meeting in Newport, June 26, 1889.

cleanliness, and is a good precaution which many use. The mercurial and boric acid solutions I find detrimental to delicate instruments, and hence I do not immerse cataract knives in them. The same might be said of passing the blade of a knife rapidly across a flame. If left long enough to destroy bacteria the edge of the blade is very apt to suffer. Boiling water ensures all that is desired, with no risk to the instruments.

The washing of the eye with weak solution of mercury bi-chloride 1 to 4,000, or mercury biniodide 1 to 20,000, or boric acid 1 to 40 is in very general use for cleansing the conjunctival surfaces both before, during and after eye operations. Water which has been boiled is found quite as good as the medicated lotions. The eye operated upon is usually in an aseptic condition; and as we desire to keep it in the same, we do not wish to impregnate the newly made wound with offending material conveyed in the water used for cleansing purposes, hence the medicated liquids in which the sponges or wiping pledgets of cotton are kept immersed while the operation is going on. This seems to be the chief protection against infection. The momentary application of these lotions to the conjunctiva can be of little service in destroying bacteria. We all do it, some going so far as to wash the face, including the eyelids, with the lotion. It is a harmless procedure, and I believe as useless as it is innocent.

Some surgeons carry antiseptic precaution to an excessive and even annoying degree. They seem to be suffering from bacterial fright, and are suspicious of the most innocent organisms. To them it is as if everyman, woman and child met with on the streets of a crowded city are assassins bent on mischief, and hence enemies. All bacteria are treated as if malignant, and are to be killed in sponges or dressings at least by the long continued application of heat. Absorbent cotton used for dressings is baked at high temperatures for hours, and then kept in air-tight jars which have been equally sterilized by long exposure in hot ovens. This seems to me a useless caution from over zeal, the more especially when I see unwashed hands manipulate the excessively prepared dressings. That

bacteria exist and are omni-present no one now questions, but that they are always bent on mischief only the over-zealous believe. Experience proves this to be the case, as no better results are obtained in treatment by those who over-do in their excessive preparations for an operation.

Confinement to bed for eye operations is another practice often annoyingly pressed to the discomfort of the patient. The eye is an isolated organ not easily influenced by the movements of the body, and therefore to a great extent independent of them. To restrict the movements of the arms and legs, and even of the jaws because the eye has received a wound at the hands of a skillful surgeon, when such restraints are not practiced, should the eye have been accidentally wounded by some crude cutting material, is inconsistant to say the least of it. It is about as rational to stop the eye from moving because the arm is broken, as to restrain the legs because the eye is cut. The confinement exacted by some surgeons, with patients who have submitted to eye operations at their hands is cruel, the more especially as the experience of others has shown these restraints to be useless, always annoying, and in some cases injurious. I have seen a patient confined to bed because an eye muscle had been advanced. Confinement to the house in such cases is bad enough. My advancement cases walk the streets unbandaged from the moment of operation, and I secure excellent results. Why should I therefore confine them? Up to within a few years nearly all eye operations were considered proper cases for bed treatment. At the present time I am glad to know that the list of such is being freely cut, with the promise of making it eventually very small.

In my own work I use bed treatment to a very limited extent, and never make it compulsory. For the day of operation, especially if chloroform has been used, patients find the bed the most comfortable place, but after the first night they may follow their own inclinations as to its continuance. I presume it is generally conceded that lid-operations, neurotomies, enucleations and muscle sections need not be cases for bed treatment. In this list I put iridectomies and cataract ex-

tractions. For the past three years my cataract patients have not been put to bed at all, and I have yet to see any injury from the enjoyment of this liberty. From the operating chair they walk to their chambers and use the beds or not, as they feel inclined.

Another annoying restraint which is gradually giving way to a more enlightened experience is *the use of the dark room* in the after treatment of eye operations. When an eye has sustained an injury either by accident or at the hands of the surgeon the common habit is to confine the patient to a dark room while undergoing treatment. With the people this is an all-pervading desire, and it is acquiesced in by the majority of physicians. Notwithstanding all of which it is a bad practice. A simple rule, and in my experience a very safe one, is to allow the patient to enjoy any degree of light which is not offensive to the eye. *If light is not annoying it will not be injurious.* By accepting this law of nature for our guidance, the use of a dark room will be found very limited in eye surgery. Before I knew better, I also thought it my duty to do as I saw others do, shut out the light of day, and used candle light for all inspections. I could not find curtains dark enough to exclude all the light that I desired to shut out. In furnishing my hospital some years since, every window in the building, wards, private rooms and passages, were completely covered with the darkest shades I could find; and when in iridectomy and cataract cases the bandages were removed I had additional black curtains, which were hung over the already too dark shades, so that the rooms were black enough to satisfy the wants of any eye surgeon. Now these funeral window dressings have all disappeared and with them the dark shades. Experience has slowly taught me that the theory was wrong and the practice bad. My desire now is to exclude harsh light only, and especially to avoid all sudden transitions. My patients are treated in moderately lighted rooms and are allowed to take all the light that they can bear with comfort, only the eye operated upon being closed. To those who will try the experiment it is surprising to find how much light can be comforta-

bly borne by the majority of eye patients, for their own advantage, and that of the attendants.

I have startled some of my specialist friends who use the candle much too freely, when I took them into an ordinarily lighted room to examine a cataract case five days after an extraction, especially when I drew aside the window shade, so that under the full light of day the examination of the eye could be made more thorougly. After watching these cases for a few days and finding much stronger eyes than they were accustomed to see under the dark room treatment, they have left me with the intention of becoming, as they say, more venturesome in the future.

Another restraint much too freely used is the eye bandage. To tie up an eye for disease or an accident, however trivial to the organ, is a popular device of universal adoption, and one might equally add of universal misapplication. By this I do not mean to infer that the eye bandage is to be discarded from surgical practice, for we often find it an essential factor for successful treatment. I refer to its indiscriminate use and consequent abuse. For pressure effects we need it, and must ever use it. When it is desired simply to exclude light, a better device can be found. In many cases it is applied to keep an eye quiet, which is a physiological impossibility. This delusion is carried out when an attempt is made to dress an eye recently operated upon for cataract or iridectomy, by surrounding it with small discs of lint systematically and beautifully piled up until all the irregularities of the orbital surface are brought to a level. These are then secured in place by a roll of bandage, for what is called equible pressure. Many years since I used to extol an elastic pad of raw cotton for filling these indications. When pressed by a bandage the soft compress would sink down, filling up an excavatory space, and give, as I then thought, an excellent support to the cut organ. I found these theories not sustained, and I abandoned that practice.

Now the only dressing I use after iridectomies and cataract extractions is a piece of isinglass plaster. It is designed simply

to keep the lids closed over the eyeball. I avoid all artificial compresses. I find the lids with their tarsal cartilages a sufficiently thick and heavy compress, a perfectly adapted splint, moulded by nature to support every part of the anterior surface of the eye-ball. When the eye is closed the orbicular palpebral muscle automatically makes just the degree of pressure needed, and retains the lips of the corneal wound in perfect apposition. After operations on the front of the eyeball, a strip of adhesive plaster fills every indication for lid restraint, and it should become the universal eye dressing. It is light, simple, easily applied, comforably worn, and not easily displaced. By the action of the lid muscle it keeps up equable support It is also transparent, so that any discharges from the eye, or any changes which the lid may take on, can be seen at the daily inspection, and the condition of the eye known without disturbing the dressing. When the object is only to close the eye, the tying up of the head by bandages, however skilfully constructed, is an annoying restraint, which patients will gladly avoid. Those who have submitted to the bandage and compresses in former cataract operations, and to the adhesive isinglass strap in subsequent ones, are loud in their praises of this simple eye dressing.

As to the tying of the hands of patients for fear they may injure the eye recently operated upon, I am glad to say that I have never practiced it. I deem it a needless and very annoying restraint. My cataract operations now exceed 1800, and are being added to at the rate of over 100 per year. To have the cut eye touched by the finger during sleep is not an extremely rare occurrence, and that the patient should be awakened with a twinge of pain is not surprising, but I have never seen any trouble come from it in these cases in which my attention was called to the accident at the time of its occurrence. Why tie up the hands of every patient, as reccommended by some eye surgeons, in order to avoid this imaginary danger? The very restraint, with the loss of sleep and the restlessness which it engenders, may bring about troubles much more serious to the eye than the accidental touching of it with the finger?

Another annoying and injurious restraint is the rigid diet enforced after eye operations. There is an idea that in some mysterious way, not anatomically demonstrated, the movements of the jaws excite corresponding movements in the eye, and therefore induce bad results upon the lips of the wound recently made in the cornea. How this notion, of the jolting of the eye by the masticatory movements of the jaws, ever secured professional recognition is very surprising, but it nevertheless shows its influence in the practice of some who feed their patients on slops for days after cataract extractions. They believe that they are following out a wise course in so doing. Their patients survive and get well. But so do also the patients of those who are not subject to this soft diet. It is said that we all eat too much, and from this standpoint a few meals the less can do no great harm. But there is another law even greater in force, which reads "to secure the ready healing of a wound with the least degree of irritation, disturb the system of the individual as little as possible, and allow the dictates of nature to remain unmolested." Take for instance our cataract cases. They occur usually in old people, in whom habits are strongly establishment. They have been accustomed to daily exercise and regular eating. To suddenly suppress in an old person these natural functions, by putting him on his back in bed, with both eyes bandaged, and on rigid diet, is not the best way to keep him healthy while the corneal wound is healing.

The following case, *excessively untrammelled during the treatment*, occurred in my practice during the month of December, 1888; Mr. M., aged 90, a wealthy old gentleman sent me an urgent appeal to come to his home, 600 miles from Baltimore, and operate upon him for cataract. Against my established custom, I, in his individual case, yielded to his entreaty and went to him. I arrived at his home in South Carolina at 2 o'clock in the day, and found him sitting by an open fire. He could see me dimly with the left eye. With the right eye in which he had been blind with senile cataract for nearly twenty years, he had good light-perception. Within a half hour after my arrival, and with no preparation whatever, I made a smooth

extraction under cocaine. The eye operated upon was dressed by the isinglass strip, and the other eye with limited sight was left oyen. With this eye he could still see to get about, and after the operation he resumed his accustomed seat by the chimney. The only change made in this room was closing the outer slatted blinds to keep out sunlight, and drawing down the shades. It was now his dinner time. After the operation he asked for his usual meal, and with my permission he had it. When 8 p. m. came he went to bed in a contiguous room, undressing himself. In the morning he was up for breakfast. I found him in his usual seat in the parlor alongside of the fireplace, a screen having been placed between him and the blaze to keep the direct rays from shining in his face. He had suffered no inconvenience from the operation, had slept well, had enjoyed his breakfast, and was in every way comfortable. I left him that day at 2 o'clock, having spent 24 hours with him. My instructions to his family physician, in whose care I left him, were to allow him all the latitude which I had established, and only keep his movements restricted to the darkened parlor and contiguous darkened bed-room, to let him have his usual meals, to look at the face and closed eye lids daily, but to leave the dressings undisturbed for six days; also to telegraph me for instructions should any unsatisfactory changes appear. I knew that the carefully applied isinglass plaster would hold on for a week, and therefore the doctor could not indulge a curiosity for a too early examination of the eye, which he might have done had the compress and bandage been used. The programme was carried out. In due time the strap was removed, no troubles had been discovered at the daily visits. The vision of the new eye rapidly strengthened. Such good sight was restored that at the end of four weeks by the use of a two and a half inch glass, the old gentleman himself wrote me a long letter of thanks, as he said to give me an evidence of his handwriting, and of his complete restoration to sight. Better results could not have been obtained had he been made to go through the most orthodox course of restraining and abstaining treatment.

ENTRANCE OF AN EYE LASH INTO THE INFERIOR CANALICULUS.

BY HENRY D. NOYES, M.D., NEW YORK.

A young man came to the N. Y. Eye and Ear Infirmary complaining of much irritation of the left eye, due, as he supposed, to a foreign body—to get rid of it he had made use of an eye-stone. The conjunctiva of the inner half of the globe was vascular and inflamed. Not finding any foreign body on the globe or lids, my assistant, Dr. Agramonte, who first saw the case, discovered a fine hair projecting about 2 mm. from the punctum of the lower lid. It swept against the globe—when I pulled it out, three mm. of it had entered into the canaliculus. The great fineness of the hair—for the patient's lashes were thin and light-colored—favored its penetration.

AN OPERATION FOR SOME EXTREME CASES OF ENTROPIUM OF THE UPPER LID.

BY HENRY D. NOYES, M.D., NEW YORK.

Some cases of entropium, the result of chronic trachoma, present difficulties which even the latest operations of Anagnostakis, Hotz and Green fail satisfactorily to alleviate; as, for example, when the eyelids naturally are short and by disease the tarsus has shrunken in all directions, and become greatly incurvated. Operations may have been done which have furnished a measure of relief, but the pressure of the lid upon the globe continues the corneal irritation.

I have for such cases suggested the introduction of a flap at

the outer angle, a measure which affords material relief, but which causes a certain amount of deformity. In the following case an entirely different proceeding was adopted with advantage.

Martin Murphy, about 47 years of age, a native of Ireland, contracted granular lids while in service in the army during the late war. He was for years under treatment at various periods and in various places. He came to the N. Y. Eye and Ear Infirmary iu 1874 and was under the care of Dr. Allen. He came again to the Infirmary in 1880 and was put under my care. At that time the left eye was the more severely affected. He had had operations upon the lid, and the eyelashes had been entirely removed by amputation. The palpebral slit was both narrow and short, the tarsal edge sharp and closely hugging the cornea; the upper lid bulging and very short. The tarsal conjunctiva was cicatrized and comparatively smooth and the cornea was the seat of extreme vascularity over its entire surface. He had been for some weeks in the Infirmary when I proceeded to operate in the following way:

Putting my finger under the upper lid and stretching it tight, I pushed a blunt-pointed knife from the middle of the edge of the lid flatwise beneath the skin to a distance above the superior margin of the tarsus, then turning the edge upon my finger, I divided all the intervening tissues including the conjunctiva. By this proceeding most of the muscular fibres and all of the tarsus were severed, the skin alone remaining to bridge over the gap. The wound opened to a distance of at least 3 mm. and healing was allowed to go on without interference. Relief began to be experienced immediately, and after 4 weeks of ordinary treatment the patient was discharged with a marked amelioration of the condition of the cornea. I have seen him again in October, 1887, and found some spots of opacity remaining on the cornea; no vascularity, no irritation, and the patient informs me that he has since the time of the operation (1880) had no further irritation of the eye.

I may remark that this proceeding was suggested by the c ase in which Mr. Critchett divided the upper lid to relieve the

swelling in ophthalmia neonatorum. I have done the same thing which Mr. Chritchett performed, viz.: division of all the tissues of the lid on its median line in a same case of inflammatory trachoma, and there was no important deformity left at the edge of the tarsus; the proceeding gave considerable relief.

The division of the tarsus subcutaneously is a proceeding absolutely free from the liability of deformity, and in the case narrated it served an extremely valuable purpose.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

FRIDAY, JULY 5, 1889. J. W. HULKE, F.R.S., PRESIDENT IN THE CHAIR.

MONOCULAR (?) SUPPURATIVE IRITIS.

Dr. Rockliffe (Hull) read notes of this case occuring in a girl aged 8. For a week before admission she had suffered from "acute iritis," without lachrymation or photophobia. The family and personal history were exceptionally good. When examined the right eye had no perception of light; there was acute iritis, the iris being studded with nodules, varying in size, their apices yellowish, their bases surrounded by bright red vessels. No hypopyon; cornea clear; eyeball not tender: T + 1. In a week all pain had disappeared, and did not recur during the subsequent history of the case. Three weeks later the nodules had increased considerably in size, and two ciliary staphymolata had appeared. A month after this date the iris was becoming atrophic with T—1; and two months later the staphymolata had entirely gone and the iris was much disorganized; T – 2. The eyeball was excised six months after the first visit, when it was somewhat shrunken. On section there was found to be total posterior synechia, with thickening of iris and ciliary body, degeneration of lens and detachment of retina. Dr. Brailey examined the specimen microscopically and reported: "Rounded collections of cells, clearly new growth, probably inflammatory, on the inner aspect of the iris and ciliary body, and in and behind the base of the iris; to a less degree in the remainder of the iris. The central cells of these collections exhibited signs of inflammation, but an absence of the characteristics of tubercle. One small collection

was present in the choroid. He considered that the case was one of irido-cyclo-choroiditis of a peculiar nature, with many of the features met with in sympathetic inflammation." Dr. Rockliffe referred to cases reported by Hutchinson, Eales, Nettleship, Lang and Benson, and thought the evidence was more in favor of inflammatory new growths than tubercle or syphilitic gummata.—Mr. Hulke understood that the speaker regarded the lesion as an inflammatory neoplasm. He inquired if bacilli had been searched for.—Dr. R. replied that no search had been made for micro-organisms.—Dr. W. J. Collins said that a case he had put on record closely resembled the one under discussion; it occurred in one eye only; the exudation was plastic in character, nodules of pinkish-grey being present. Vision was not greatly damaged and the case did not go on to suppuration. He had ventured to name it "granulation iritis." Mr. Hutchinson, in the 8th volume of the *Moorfield's Hospital Reports*, had recorded five cases occurring in children above the age of infancy; in not one was syphilis excluded, and in more than one it was distinctly proved to exist. He believed that some cases were due to overlooked traumatism. Dr. Mules though it was by no means too late to seek for bacilli if any material were still available.—Dr. Rockliffe said there was no history of injury, and he had no material at hand for a bacteriological examination.

Cavernous Angioma of the Orbit.

Dr. Emrys Jones (Manchester) communicated this case: The patient was a girl, aged 18, who first came under observation in June, 1884, with protrusion of the left eyeball, which had been slowly increasing for nine years. The proptosis then measured an inch an a half. An elastic tumor could be felt eveloping the eyeball. There was no pulsation, no fluctuation, no pain. Downward movement of the eye was lost; other movements diminished; pupil reacted to light, optic nerve pale, V = 14 J. On July 17, ether was administered, the globe enucleated and a cone-shaped tumor contained in a capsule scooped out. The optic nerve was found imbedded

along the inner aspect of the growth which measured 8 centimetres × 7 centimetres × 5 centimetres. Microscopically the growth consisted of an open sponge-like framework of fibrous tissue, with numerous round sinuous, irregular cavities filled with blood. Sections of the growth were shown. The president spoke of a specimen of cavernous angioma in the Moorfields Hospital Museum which was removed from the orbit of a young boy by the late Mr. Critchett. In that case there was no palpable pulsation, but the proptosed eyeball could easily be pushed backwards into its normal position, showing that there was no solid mass behind it.

Sarcoma of Ciliary Body.

Mr. Simeon Snell (Sheffield) related notes of two cases: The first occurred in a woman, aged 62, whose right eye was affected. She was first seen on December 2, 1879. Patient complained of a spark from the fire striking the eye sixteen months before; it was, however, well in a few days; fonr months ago she observed a dark brownish speck in the upper and inner ciliary region; it was then about the size of a pin's head. When seen vision was good, no pain. The elevation in the ciliary region was the size of a small pea and extended close up to the cornea; it was also visible internally and extended for some distance close to the ciliary margin of the iris. The patient disappeared for a time, but returned with the growth enlarged. Enucleation performed August 30, 1880. The tumor was a melanotic sarcoma. 2. A man, aged 74—First seen in April, 1883, when he complained of increasing dimness of sight of his right eye. There was then some opacity of the lens. In February, 1884, when he again presented himself, there was a blackish discoloration, and some bulging of the selerotic (ciliary region) above. Vision was lost. The eyeball was excised on March 24, 1884. The tumor was much larger than the external appearances suggested, about the size of a bean and had the appearance of a pigmented round-celled sarcoma. The patient was reported alive and well, and showed no evidence of recurrent growth, although more

than five years had elapsed since the operation.—*British Med. Jour.*

REPORT OF THE 25TH ANNUAL MEETING OF THE AMERICAN OPHTHALMOLOGICAL SOCIETY.

HELD AT THE PEQUOT HOUSE, NEW LONDON, CONN., JULY 17 AND 18, 1889.

[CONCLUDED.]

A CASE OF DOUBLE CHOKED DISC DUE TO INTRACRANIAL TUMOR, WITH AUTOPSY.—By Dr. C. S. Bull, New York.

The patient, a young married woman æt. 23 years, was seen June 30, 1888. In February, 1888, she had a miscarriage and was quite ill for a couple of weeks. There was dull headache at the vertex. This became more severe. During April there were occasional attacks of diplopia. During May there was failing vision. When examined $V = {}^{18}/_{xx}$ in each eye. Accommodation was normal. There was no peripheral limitation of the field of vision either for form or color. There was an irregular negative scotoma for all colors. There was marked exudative neuro-retinitis with hæmorrhages in both eyes. Urine proved normal on examination. The only symptoms of intracranial disease were the lesions of the optic nerve and the headache at the vertex. The diagnosis was intracranial tumor at the base of the brain. Vision rapidly failed and by September 25 there was no perception of light. The mental faculties gradually became impaired. High hemianæsthesia came on. The patient died May 5, 1889. Autopsy showed a tumor involving the corpora quadrigemina and extending to the anterior crura of the cerebellum. The growth appeared to be a glio-sarcoma.

DR. O. F. WADSWORTH, Boston, reported a case of

TORTICOLLIS CURED BY TENOTOMY OF THE EXTERNAL RECTUS.

Partial Tenotomies in Cases of Neurasthenia with Insufficiency of the Ocular Muscles.—By Dr. Myles Standish, Boston.

The author reported five cases in which he had performed this operation on account of constant headache, inability to use the eyes and neurasthenic symptoms. In all but one there was marked and prompt relief of the local and general symptoms by the operation. Cases requiring operation are comparatively rare.

Notes on Some Vagaries of Accomodation.—By Dr. David Coggin, Salem.

A case was of hypermetropic astigmatism passing into myopia. A case of recurrent spasm of accomodation was also reported. The third case was one of temporary anomaly of sight occurring daily. In the morning the patient could see well, but in the afternoon he could not recognize objects across the street. Double vision also occurred. The disturbance is gradually disappearing.

Effect upon the Accommodation of a Patient's Eye Caused by Looking into a Mirror set Obliquely in the Room, during Ophthalmoscopic Examination.—By Dr. E. E. Holt, Portland.

Directing the patient to look with one eye into a mirror set obliquely while the other was examined with the ophthalmoscope an element of ease was found in making the examination and of comfort and steadiness on the part of the patient never experienced before. The eye fatigues quickly in looking at a single object. Looking into the oblique mirror gives the impression of gazing into the distance. A notable change in the pupil will be observed when the patient is directed to look at an object at the distance of the mirror and when he is directed to look at objects reflected from it.

PARALYSIS OF THE SPHINCTER IRIDIS.—By Dr. O. F. Wadsworth, Boston.

A case was reported of paralysis of the sphincter iridis, without affection of the accomodation, lasting several months and following the instillation of homatropine in both eyes.

DISCUSSION.

DR. SAMUEL THEOBALD, Baltimore.—In all such cases it is important to exclude malingering. It would be possible for the patient by the use of a weak solution to keep up the mydriasis without affecting the accomodation.

Dr. SAMUEL D. RISLEY, Philadelphia. —Another practical explanation of such cases is the use of a pipette previously used for a solution of a mydriatic, for a solution which contains no mydriatic.

Dr. JOHN GREEN, St. Louis, presented a

SERIES OF GEOMETRICAL CONSTRUCTIONS ILLUSTRATING CERTAIN CASES OF OBLIQUE PENCILS REFRACTED AT CYLINDRICAL AND SPHERICAL SURFACES.

Dr. JOHN GREEN also read a paper on some of the

STEREOSCOPIC ALTERATIONS EVOKED BY UNEQUAL GLASSES PLACED BEFORE THE TWO EYES.

THE EMPLOYMENT OF OLEATE OF VERATRIA TO FACILITATE THE DETERMINATION OF ERRORS OF REFRACTION.— By Dr. Samuel Theobald, Baltimore.

A mydriatic affords valuable aid in myopia and in hypermetropia, but in astigmatism its use is not so satisfactory. In astigmatism he had found great help from the use of a 10%

oleate of veratria to the temple and forehead once a day for three or four days. This seems to exert a quieting effect upon the ciliary muscle, and especially of the radiating fibres, and lessens the tendency to asymetrical accomodation. The following rule was formulated in regard to the correction of astigmatism. When the astigmatism is according to the rule we need correct only that which is readily made manifest. On the other hand in astigmatism against the rule, we are warranted in correcting fully every part of the defect which can be rendered manifest.

The Inefficiency of Hydrobromate of Homatropine in Controlling the Accommodation for the Purpose of Fitting Glasses.—By Dr. E. E. Holt, Portland.

The experience of the writer was that this drug could not be relied upon. He reported one case in which the latent hypermetropia revealed by 3% solution of hydrobromate of homatropine was just one-half of that revealed by 1% solution of atropia.

DISCUSSION.

Dr. Edward Jackson, Philadelphia.—I have found homatropine entirely satisfactory when used properly. The instillations must be repeated at short intervals, five or ten minutes, and three or four instillations practiced. The effect rapidly passes off and the examination must be made within one or two hours. I have followed the use of homatropine by another mydriatic without alteration in the result.

Ametropia as Determined under Complete Mydriasis.—By Dr. Edward Jackson, Phila.

He had examined 4000 eyes under complete paralysis of the accommodation and presented the following table of his results. These were compared with results obtained by another observer without mydriasis.

	With Mydriasis.	Without Mydriasis.
Compound hyperopic astigmatism—	40%	9½—
Compound myopic "	9	11
Simple hyperopic "	6	16½
Simple myopic "	2	24
Mixed astigmatism—	6½	2
Hyperopia—	31	10
Myopia—	4	9½
Emmetropia—	1½	17½

Dr. Jackson also presented a paper on

Accuracy in the Prescription of Prisms.

Dr. W. S. Dennett, New York, read a paper in which he suggested

A New Unit of Angular Measurement for Prismatic Glasses.

Dr. George C. Harlan; Philadelphia.. exhibited

Periscopic Cylindrical and Sphero-Cylindrical Lenses.

A Case of Amblyopia Due to Chloral Hydrate.—By Dr. W. F. Mittendorf, New York.

The object was to put on record a case of toxic amblyopia due to chloral hydrate. The patient had for six months been in the habit of taking 40–60 gr. of the drug at night to induce sleep. Suspension of the drug relieved the amblyopia.

Executive Session.

Officers for ensuing year.
President, Dr. Hasket Derby, Boston.
Vice-President, Dr. George C. Harlan, Philadelphia.
Secretary and Treasurer, Dr. Samuel B. St. John, Hartford.
Corresponding Secretary, Dr. J. S. Prout, Brooklyn.

Delegate to the Ex. Com. of the Congress of American Physicians and Surgeons, Dr. John Green, St. Louis; *Alternate,* Dr. D. B. St. John Roosa, New York.

The following were elected to membership:

Dr. Carl Koller, New York; Dr. R. A. Reeve, Toronto, Canada; Dr. David Harrower, Jr., Worcester, Mass., and Dr. Geo. E. de Schweinitz, Philadelphia.

The society then adjourned to meet at the Hotel Katerskill, the third Wednesday of July, 1890.

(Wm. Morrison, Stenographer.)

YORKSHIRE BRANCH OF THE BRITISH MEDICAL ASSOCIATION.

Presidential Address of Some Points of Progress in Ophthalmic Surgery.

BY SIMEON SNELL, M.R.C.S., PRESIDENT OF THE BRANCH.

Delivered at the Annual Meeting, at Sheffield.

After a reference to matters affecting the Branch and its work, the author proceeded: No one can, I think, on taking a survey of medicine or surgery of to-day, doubt how little applicable to the present time is Lord Bacon's sneer, when he said "that these (medical) sciences stand at a stay, and have done for many ages." The time we live in is essentially one of progress, and not less so this is true of medicine and surgery than it is of science. Look where we will, and on every hand and in every department is evidence of activity. True it is that much that is called progress may, in the course of time, be proved to have been spurious, but much must remain as permanent advances.

The increase in our knowledge of nervous diseases and the elucidation of many problems connected therewith in clinical, pathological, as well as histological respects, is at once evi-

dent as one of the many paths along which medicine has and is traveling on the road of progress. For certainly one of the brighest pages in medicine and surgery of this or any time is the one recording the successful efforts at the localization of nervous function, and the consequent recognition of the seat of disease and the surgical means which have satisfactorily, in many cases, been adopted for its eradication.

Again, in the domain of surgery may be mentioned the widened field opened out by the improved means of diagnosis and treatment of abdominal disorders. Other directions in which the progress of medicine and surgery is evident will at once be apparent.

In speaking, however, of progress, I am not sure that sufficient stress is always laid upon the greatly improved means at our disposal for investigating disease, and the necessity which in consequence, among other causes, has arisen for the more exact and complete recording of cases. These are both, I take it, great advances of themselves. There is a leaning toward exactness, but it must be confessed in truth that in too many respects the goal is still remote.

It is not long since that the cavities of the body were more or less sealed and impenetrable as far as the medical eye was concerned. The groping in the dark has ceased, and now their recesses are illumined, and an insight is held to be necessary, and for this the simple knowledge of how to use a mirror is largely responsible. Not only is this insight true of the ophthalmoscope and the interior of the eye, but who for instance would ever now syringe an ear without examination with mirror and speculum, or would give an opinion on a nasal case without the use of similar instruments, or a laryngeal one without the laryngoscope. The same in other ways will at once suggest themselves. In every direction facilities have increased for the greater use of the eyes in diagnosis. Not that the value of the sense of touch is lessened, but that sight is enabled to be taken more advantage of.

Now, in this general progress to which allusion has been made, as well as in the acquirement and use of better and

more accurate means for investigating disease, and the consequent more exact and complete recording of cases, the department of surgnry in which I am specially interested has borne its part and reaped corresponding advantages. Many of the ways in which progress could at once be indicated have on many occasions been demonstrated, and are some of them now so apparent as hardly to need further remark. My intention to-day is rather to leave this well-trodden track, and to briefly refer to some points in comparatively recent work—of interest, I trust, outside the confines of ophthalmic surgery.

Let me take an instance illustrating the more exact investigation of a case as practiced now than was formerly done. The pupil shall serve as the text. At one time, and at not such a remote period, it was held to be sufficient to note with respect to it that it acted to light or was sluggish, was contracted or dilated. Now we know that much labor has been bestowed on the investigation of the pupillary movements and their significance. Its indications frequently in a treatise now find separate notice, and often at some length. The conditions of its reflexes as an aid to diagnosis in locomotor ataxy, general paralysis of the insane, and other nervous disorders, are well known. An examination nowadays of the pupil, not pretending to be exhaustive, would include the following among other points: Does it act to light? If so, does it do so to light thrown on all parts of the retina? For it is known that, in some cases of hemianopsia, light projected on the portion of nervous expansion in which function is in abeyance or abolished does not occasion a pupillary response. Exclusion of the fellow-eye has been taken for granted.

Further, does the pupil act to accommodation? If so, and it does not respond to light, the well-known Argyll-Robertson phenomenon is present, so indicative of spinal disease. Again, does it act to convergence? There are other reflexes, such as from surface-irritations, which I need not refer to. Is the pupil dilated? If so, to what extent? And the measurement may be taken with a pupillometer, indicating, also, whether the size was recorded in the shade or light. What is the effect of

atropine? Does it further dilate the pupil or not? Does eserine contract it? If so, does it do so fully or not? If the pupil is contracted, note the effects again of atropine or eserine.

These latter points are of importance in deciding whether the mydriasis or myosis is dependent on irritative or paralytic lesion. In what has been said no account is taken of the effect of disease in the iris, and the pupil is regarded only as an index of disease elsewhere.

Passing next to the consideration of the ways in which progress has been made in the methods and means of investigating disease, I will take the perimeter as my example. Under the ruder and rougher methods, the lessons to be taught by an examination of the visual field could not be understood. With the means which have been now at our disposal for some time, thanks in our country to the labors of Mr. McHardy and Mr. Priestley Smith, the field of vision is able to be mapped out with something approaching exactitude. Most valuable information has been gained, and this not only as aiding to the diagnosis and prognosis in some cases, but also, in some cerebral lesions, to their localization. Among other diseases, its use may be mentioned both for diagnosis and prognosis in the insidious non-inflammatory form of glaucoma. The perimeter. moreover, has not merely taught lessons as to the perception of light, but as to colors as well.

A case illustrating particularly the value of perimetric taking of the field of vision came under my notice about this time last year. A young married woman had been severely injured in the Doncaster railway accident of the preceding September (1887), and she was suing the railway company for damages. Her injuries had been very severe. Amputation at the right thigh had immediately been required, and the left leg was severely fractured. She lost a considerable amount of blood, had been badly knocked about the head and neck, and had remained more or less insensible for three days. My friends, Messrs. Knight and Garrard, who had been in attendance, referred the case to me to report on her vision for the trial. I found that sight was perfect, and that the weakening of ac-

commodation from which she suffered was completely relieved by spectacles, and with these she was enabled to read with comfort. There was no tangible change in the optic nerve discoverable by the ophthalmoscope. I was aware, however, that Mr. Garrard for some time believed that the visual field was somewhat contracted. A casual examination was sufficient to enable me to agree with the accuracy of Mr. Garrard's surmise, and a careful mapping out of the fields of vision demonstrated a decided narrowing in each, but more especially in the right. Moreover, the field for red was also correspondingly contracted in each eye.

Here was a fact that could not be got over. The charts colored, as now shown [the charts colored were shown at the meeting; they are now of course plain,] placed before the jury, presented evidence more telling and tangible than verbal cnuld be. Mr. Garrard had known for some time that the field had been contracted, but there was no evidence whether the impairment indicated by the perimetric charts was progressive or stationary. The optic nerve yielded only negative evidence. The cause of this peripheral retinal impairment and other questions connected therewith I must pass by, and I will merely add that the woman's severe injuries entitled her to handsome compensation. The company offered £600; she wanted £800, and the jury awarded her £1150.

The revolution which has been wrought in general surgery by the introduction and adoption of antiseptics has not been without effect on ophthalmic surgery. Without desiring at all to question the better results, which by a tolerably general consensus of opinion have been obtained under a strict antiseptic *regime* in general surgery, I am free to confess that it has seemed to me that in attributing so much to the kind of antiseptic used and the plan adopted, too little credit has been assigned to the increased care and cleanliness practiced in the treatment of wounds of all kinds. The principle involved in drainage of wounds, for instance, must exert its influence for good, quite independently of any antiseptic system.

It may be admitted that the greatest care had for long been

taken as to the performance and after-treatment of ophthalmic operations, but at the same time it is quite noticeable that increased vigilance is exercised now as to the cleanliness of the instruments, and to details in preparations for operations. Generally speaking the results have been better. I believe I was one of the first in this country to record the adoption of antiseptic precautions in cataract operations. That was before this Branch in a paper[1] in 1878. Carbolic acid was then the antiseptic used, but even in weak solutions it was condemned as irritating, and the convalescence of cases after operation was stated to be prolonged.

Perchloride of mercury, after a trial of many others, is the agent now mostly employed, and it is used in weak solutions, 1 in 5,000, or less. Before proceeding to operate for a case of cataract, for instance, the patient's face should have been well washed with soap and water, especially about the eyes and eyebrows. Then immediately before operating the eyes outside are bathed with the perchloride solution, and the lids are separated and the solution allowed to run freely over the globe and under the eyelids. Most antiseptics act injuriously on the instruments, and, therefore, their immersion should only be momentary. For my part I believe it is sufficient to see that your knife is *spotless* and then to place it and your other instruments in absolute alcohol before using.

Some operators will assert that antiseptics completely banish suppuration from their cataract cases. I am disposed to agree that, with the precautions I have pointed out, with cleanliness in the nursing afterward, and with good sanitary surrounding, suppuration should be only of the rarest occurrence.

In a less methodical manner there are many additional ways in which antiseptic agents are of use in ophthalmic surgery, and upon which I cannot now touch. Iodoform is a most valable remedy, whether it be in combating the gonorrhœal gonococcus in the conjunctiva, or checking sloughing corneal wounds, whether after operation or otherwise.

[1]Brit. Med. Jour., 1880, vol. i, p. 241.

Any reference to the changes in recent ophthalmic practice would be singularly incomplete without a mention of cocaine. The introduction of this remarkable agent, only about four years and a half ago, immediately wrought a complete revolution, and the test of time has well substantiated its value and efficacy. Valuable, however, as the drug has proved to be in other directions, it is in the field to which it was originally introduced that its properties are most esteemed and find their most constant use. In my own practice, hospital and private, general anæsthetics have almost been put on the shelf, and are only resorted to as a rule in cases requiring enucleation of the eyeball, or in those which are for some reason exceptional. Speaking generally, all conjunctival and corneal operations are done under its influence, as well as strabismus, cataract operations, puncturing the sclerotic, and cases necessitating the use of the electro-magnet. Iridectomies and operations on the iris must also be added to this list. Ether is still necessary, as before mentioned, for removal of the eyeball. But, here also, I must have performed more than a dozen enucleations with the aid of only cocaine. Generally they have been cases in which, for some reason or other, the use of an anæsthetic was wished to be avoided. After instilling a 3 per cent solution three or four times during the quarter of an hour or ten minutes preceding the operation, it will be found that the conjunctiva may be divided without pain; then, after checking the bleeding, the cocaine solution is allowed to run freely over the insertions of the tendons, and by avoiding undue haste, it will often be found that the recti may be divided and the operation performed almost painlessly down to the division of the ciliary nerves surrounding the optic nerve. The latter step certainly causes pain, though once or twice a patient has stated that he has suffered hardly anything. Invariably however, I think, they have expressed their pleasure at the operation having been performed without a general anæsthetic.

[TO BE CONTINUED].

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A FEW MAGNET EXTRACTIONS OF IRON FRAGMENTS IN THE VITREOUS.

BY F. C. HOTZ, M.D., CHICAGO, ILL.

My experience with the magnet as an ophthalmic instrument is very limited, because among the many cases of iron or steel chips in the vitreous there were only three which, in my judgment, were suitable cases for the operation. The presence of iron in the vitreous alone is not a sufficient indication for this operation; besides being convinced the foreign body is in the vitreous we must also have good reason to believe that after the removal of the iron the eye will recover, if not any vision, at least such a good condition that its preservation is an object to the patient, and that it will not become a source of danger to the other eye. Consequently, I cannot consider the operation applicable to cases where the eye has been so extensively wounded that, foreign body or no foreign body, the lesion itself will necessarily cause complete atrophy of the eyeball; nor is it applicable to eyes in which the irido-choroiditis incited by the foreign body is so far advanced that the unavoidable result will be an irritable and dangerous stump, even if the magnet operation be successful.

The degree and extent of the traumatic inflammation, as especially indicated by the seat of the vitreous and the tension of the eye, has to decide the question whether or not the magnet can be employed with advantage and to the benefit of the patient. The best result, of course, is promised by those eyes which show little or no inflammation, either because they are seen very soon after the accident or because the eye has shown an unusual degree of tolerance to the foreign body.

The first two cases of mine are samples of this kind. In the third case a moderate degree of inflammation was present, and though the magnet operation was unsuccessful, it was probably the most instructive case of the three, because the enucleated eye revealed a condition of the vitreous which fully accounted for the failure.

1. *Chip of steel, weighing 9 milligrams, in vitreous 24 hours; no signs of inflammation; magnet successful, and good vision restored.*—On the evening of August 28, 1882, Frank C., æt. 17 years, called at my residence, stating that in the afternoon the edge of a steel punch broke off and struck his right eye. The eye was neither red nor painful, but the sight was considerably blurred. Six millimeters from the nasal margin of the cornea, and just below the lower border of the internal rectus, there was a minute opening through conjunctiva and sclera, from which a small bead of vitreous protruded; cornea and lens normal; in the center of the vitreous the slender chip of steel, its bright fresh surface glittering like polished silver; the track of the foreign body was marked by a few dark streaks extending from it toward the sclera; otherwise the vitreous was not disturbed, and the fundus, so far as it could be examined, showed no lesion.

As I was not prepared to operate at once, I put a drop of atropine in the eye, applied a bandage and arranged with the patient to be operated on the following afternoon at the Infirmary.

At the appointed hour, the patient being ready, another examination showed the foreign body in the same place and the condition of the eye the same as on the previous evening.

Chloroform was used, the scleral wound was enlarged, and while its edges were held apart with fine hooks, Gruening's magnet was slowly introduced toward the center of the vitreous; after pausing a moment it was again slowly withdrawn, but the steel did not come with it. The second attempt, however, was successful, the magnet brought the fragment up into the wound where it could be picked up with the forceps. The conjunctiva was then closed over the wound by a fine silk suture, and both eyes were bandaged, and the patient kept quiet for the next five days.

September 4. Conjunctival suture removed; wound is closed, eye shows no sign of inflammation. Vitreous shows no other disturbance except that made by the magnet.

September 25. The eye has been feeling perfectly well all the time. V.=$^{20}/_{xxx}$; the dark streaks in the vitreous are much shortened, only just visible in the scleral wound.

The patient then returned to his work and, I am sorry to say, never presented himself, so that I am not prepared to state whether this excellent result was permanent.

2. *Fragment of iron, weighing 3 milligrams, in vitreous 10 days; magnet successful; traumatic cataract.*—G. R., æt. 23 years, was admitted to the Eye and Ear Infirmary January 31, 1888. Ten days previously a scale of iron from a hammer entered his right eye. We found a small linear scar in the cornea between center and temporal margin, a small button-hole in temporal side of the iris, and considerable opacification of the temporal half of the lens; but there was only very slight pericorneal injection and the pupil responded readily to atropine. The vitreous was still clear and in its anterior nasal portion the ophthalmoscope discovered a small body with a bright metallic reflex; when the eye was moved it flitted about through the vitreous, and when the patient reclined his head, it sank back toward the fundus. On this account the operation was performed under cocaine, the patient sitting up with his head rather inclined forward. A meridional incision was made between rectus inferior and internus; the edges being held by fine sharp hooks, a slender and slightly curved point of an

electro-magnet was introduced. The second trial brought the chip out, followed by a small quantity of watery fluid and a small bead of consistent vitreous. The latter was cut off and the conjunctiva closed with a fine silk suture.

February 5. Patient had no pain since the operation; suture removed; there was no inflammatory disturbance in the vitreous.

March 18. Opacity of lens was increased so much that illumination of vitreous was impossible; but otherwise the eye appears normal. Tn.

April 20. Mature cataract, with good perception in all parts of the field.

3. *Fragment of steel, weighing 2 milligrams in vitreous one week, cyclitis, vitreous hazy, but foreign body still visible; failure of the magnet; enucleation.*—E. C., æt. 31 years, a horse-shoer was seen May, 28. One week before while shoeing a horse he received a fine chip from the edge of the clinching block in his right eye. Did not think much of the accident because he had no pain and the sight was not obscured. Two days later, however, the eye became painful and inflamed and the sight grew dim. The pain was especially severe at night and was described as a sharp cutting in and over the eyeball.

Status præsens—Considerable pericorneal injection; in the sclero-corneal border at the temporal end of the horizontal meridian, a minute linear scar; pupil dilated *ad maximum* by atropine; lens perfectly transparent; vitreous hazy, but while in its nasal portion the mist is thin, as shown by the red reflex of the fundus, it is condensed to a gray cloud on the temporal side; but still it is possible in this cloud to perceive a bright shining body, located in the temporal section of the vitreous, a little above the horizontal line. Tn., V= fingers at one foot.

The eye was so sensitive that the repeated instillation of cocaine had no effect and it became necessary to use chloroform.

A meridional incision, $2^1/_2$ millimeters long, was made between rectus externus and inferior, an electro-magnet not being ready for use, Gruening's permanent magnet was employed

and introduced in the direction where the foreign body had been located by the ophthalmoscope. But though I carefully explored the whole region where the foreign body was situated, by changing the position of the magnet at each subsequent introduction, the steel fragment did not come out, and after twelve trials had been unsuccessful I proceeded at once to enucleate the eye (the patient's consent for this emergency having been obtained before he was anæsthetized).

I removed the cornea, iris and lens of the enucleated eye and then could show the track the magnet had left in the vitreous lead directly to the very small scale of steel which was found where I had located it, in the temporal and upper portions of the vitreous, 3 millimetres from the retina. It was evident the magnet must have come in contact with the foreign body repeatedly in my attempts at extraction; but why did it fail to extract it? The answer was given by the following experiments:

The magnet was again introduced through the scleral incision and passed through the vitreous in the same way as during the operation; when it came within one millimetre of the foreign body this could be seen to jump toward and cling to the point of the magnet, and when now the latter was slowly withdrawn the scale followed it until it was moved about 2 to 3 millimetres from its position, when it suddenly sprang back as if jerked back by an elastic string. This experiment was repeated several times and always with the same result. The whole vitreous was opalescent, but around the foreign body it was streaked with white fibrinous strings which held the scale so firmly within their grasps that when I finally removed it with the point of a scapel it dragged the vitreous with it, and it required considerable traction to break down these resisting bands. It is obvious that against such resistance any magnet is powerless.

EXTIRPATION OF THE LACHRYMAL GLAND CAUSING ATROPHY OF THE OPTIC NERVE THROUGH HÆMORRHAGE INTO THE ORBIT.

H. GIFFORD, M. D., OMAHA, NEB.

Since Lawrence's energetic advocacy, in 1867, of extirpation of the lachrymal gland, to cure undue lachrymation and dacryocystitis, the procedure has received but little attention till comparatively recently. Most authors if mentioning it at all, do so with disfavor. For some years, however, occasional continental writers have adopted it with considerable enthusiasm. The latest contribution to the subject, by Truc (*Archives d'Ophtalmologie* 1889, 4.), recommends it as a very efficacious adjuvant to the ordinary treatment of trachoma, where their is obstinate stricture of the nasal duct. The operation is so simple and the risk apparently slight that the temptation to perform it is very great in cases of otherwise incurable over-lachrymation. The objections to the operation hitherto have been based upon the possible occurence of phlegmon of the orbit and of ptosis. The following case shows that still more unfortunate complications may occur.

J. B. æt. about 60. History of dacryocystitis of left side for about a year. Stat. praes. R. E., normal; L. E., chronic catarrhal conjunctivitis; chronic dacryocystitis, moderate stricture of the lachrymal canal, ectropium of the lower lid. The upper canaliculus was slit and the usual probing and syringing treat-

ment carried on for the past ten days with some improvement. As I was then called away from the city, my colleague, Dr. Graddy, took charge of the case and as the condition seemed to remain stationary for several days, he decided to extirpate lachrymal gland. The operation was performed June 21st, with ordinary antiseptic precautions. The incision, about an inch long was made just below the eye-brow at the outer side, and was closed with an interrupted suture. There was an unusually free hæmorrhage during the operation, and though this had apparently ceased when the wound was closed, the bandage had to be changed twice in the first 30 hours, on account of oozing from the wound. When the dressing was changed, the second time, the oozing had ceased, but the upper lid was so swollen with infiltrated blood that the eye could not be opened. When I saw him a few days after the operation, the wound had healed without a trace of inflammatory reaction but the upper lid and ocular conjunctiva were still full of coagulated blood, the skin of a purplish hue, and the patient complained of a dull pain in and around the orbit. As the swelling was subsiding, the man, at his earnest request, was allowed to return to his home in the central part of the State. As no anxiety was felt as to the ultimate result, the eye was merely glanced at, not examined functionally. After a week, the patient wrote that the pain and swelling were much diminished but that the lid still hung down and when it was lifted the eye seemed blind. Four weeks alter the operation he returned and the following conditions were found: R. E. normal; L. E. complete ptosis; dacryocystitis apparently cured; ocular conjunctiva with slight brickred tinge from incomplete absorption of the infiltrated blood; eye-ball almost completely motionless; pupil moderately dilated, direct light-reflex absent; media clear; retina at fundus filled with intervascular hæmorrhages, not fresh, but with the discoloration one would expect after a lapse of some weeks; vessels small and nerve completely white. The picture was almost similar to that figured by Knapp, (*Archiv. fur Augenheilkunde*, xiv., Fig. 3) as the result of thrombosis of the re-

tinal vessels from orbital cellulitis except that no obliterated veins and more hæmorrhages were observed. There was no perception of light. The external appearances remained unchanged for a month longer, when, as his physician, Dr. Gaune of Central City, kindly informes me the man fell dead in his yard, from some cause not clearly ascertained. He was not a bleeder; both before and after the removal of the gland he bore minor operations without unusual hæmorrhage.

I am aware that the above description alone does not make it perfectly clear that there may not have been some orbital cellulitis to account for the unfortunate result, but to any one seeing the case, such a diagnosis was out of the question. The whole train of symptoms was evidently due to an infiltration of blood into the lid and orbital tissues, the pressure causing thrombosis of at least one of the retinal vessels and interfering with the function of the motor and optic nerves. [1]In the paper of Knapp referred to, on blindness caused by thrombosis of the retinal vessels in facial erysipelas, he speaks as if there were no doubt about thrombosis from pressure having occured in both vessels, but as I see nothing in the symptoms observed by me, which could not be accounted for by primary thrombosis of the vein alone with secondary obliteration of the artery, I prefer to leave the matter undecided.

The only approach that I have found to an indication that so unfortunate a result could occur from the operation is in the text-book of Soelberg-Wells where, without apparently having had any personal experience in the matter, he remarks that all bleeding should be carefully stopped before infiltration of the blood into the lid may occur. It is possible that if the wound had not been closed at all for the first 24 hours, the result would have been different in this case, but to be as safe as possible, I should, in another case, leave in a drainage tube until it were certain that all bleeding had ceased.

[1] The optic nerve atrophy would, of course, have resulted from the thrombosis alone, but it might easily have resulted simply from the pressure. I have seen several cases of atrophy from hæmorrhage into the orbit, without any sign of thrombosis.

Besides exhibiting a hitherto unnoticed danger in the operation for extirpating the lachrymal gland, the case is of scientific interest from the rarity with which retinal hæmorrhages have been observed in thrombosis of the retinal vessels. In the 35 cases collected by Knapp, his own was the only case in which hæmorrhages had been directly observed, though they probably occurred in others, but were concealed by the condition of the cornea until they were absorbed. Moreover, the case is the only one so far as I know, in which thrombosis with retinal hæmorrhages has been observed from bleeding into the orbit.

ESERINE IN EPISCLERITIS.

BY S. MITCHELL, M.D., HORNELLSVILLE, N. Y.

I have recently had occasion to test the merits of eserine in the treatment of three cases of episcleritis. Not that I think the trial of it, in so small a number of cases, is a conclusive test. Yet the benefit derived from its use in these three cases was so prompt and lasting withal, that I have yielded to the temptation to publish my experience.

Case I.—Adam A., æt. 40 years. Shoemaker. No previous history of rheumatism or gout. Has been troubled with episcleritis in right eye off and on for the past two years. When first seen by me the eye was red and painful; considerable bulging of sclerotic near lower corneal margin. Vision was R. $^{20}/_{LXX}$, L. $^{20}/_{XX}$, E. The defective vision in sight is due to corneal nebula, the result of ulceration several years previous.

Atropine, hot water and boracic acid were employed in conjunction with alteratives. Improvement was spasmodic; would be better one week and worse the next. This condition of advancement and recession continued for several months, until one day,when he came to my office with his eye more inflamed and painful than usual, I instilled into it three drops of a weak solution of eserine (gr. j to ℥i). This caused no pain in the eye or about the temples as is usual with eserine, on the contrary there was considerable diminution of the pain and congestion. He was given a quantity of the solution with directions to use it twice a day. At the end of one week the eye was apparently well, as the pain, congestion and bulging were entirely gone. The drops were continued for a week longer to clinch the cure, which it most certainly did as there has

been no return of his old trouble in the four months that have elapsed since first using the eserine.

Case II.—Miss R., æt. 21 years. Seamstress. No history of rheumatism. Has episcleritis in right eye of two months' standing. Bulging and congestion on temporal side of sclerotic. Vision, R. $^{20}/_{\text{xxx}}$ L. $^{20}/_{\text{cc}}$. Atropine, hot water and boracic acid were prescribed. There was some improvement for a week. At this time vision was again tested, both eyes being fully under the influence of atropine: R.V.$^{20}/_{\text{cc}}$, with $+3$D.$\bigcirc$.75 D. Cyl. Axis $115^\circ = {}^{20}/_{\text{xx}}$. L.V.$^{20}/_{\text{cc}}$with$+1.75$ D.$\bigcirc+2.75$ D. Cyl. Axis $90^\circ = {}^{20}/_{\text{LXX}}$.This being the best result obtainable, the above glasses were ordered after making slight deduction from sphericals. They were worn constantly and during the few weeks she remained under observation, improvement was more decided. There, however, remained slight bulging and congestion of sclerotic. After an absence of six months this patient returned to me with the old episcleritis in full bloom, stating that the eye had given her very little trouble, though never entirely well, since last seen by me, until a few days before, when suddenly, without any apparent cause, there was a return of the old trouble as bad as ever. Eserine in the same strength as in the preceeding case was prescribed, no other remedy being employed except hot water. The eserine was used three times a day, causing the pain, congestion and bulging of the sclerotic to disappear almost entirely within the first week of its use. The drops were continued for a week after the eye was apparently well, at the end of which time my patient celebrated her recovery by marrying.

Case III.—Mrs. G., æt. 35 years. Seamstress. No history of rheumatism. First consulted me October 30, 1888, on account of poor vision. R. V. $^{14}/_{\text{cc}}$ with $+2$ D. Cyl. Axis $60^\circ = {}^{20}/_{\text{LXX}}$. L. V. $^{20}/_{\text{cc}}$ with$+2$ D.Cyl. Axis $90^\circ = {}^{20}/_{\text{LXX}}$. These glasses were prescribed and worn constantly. The fundus oculi showed the marks of very extensive choroiditis, there being everywhere present in the field patches of choroidal atrophy. So numerous were these patches that it was a source of wonderment to me that even as good vision as $^{20}/_{\text{LXX}}$ was obtainable.

With the ophthalmoscope 5 D. of hypermetropia was diagnosed, although at this time the addition of spherical lenses produced no improvement in the near or distant vision. The cylindrics were worn constantly with great satisfaction, until about one month ago, when she called on me with unmistakable episcleritis affecting both eyes, there being a bulging and congested spot on the temporal side of the right and the same on the nasal side of the left eye. Thinking that perhaps the high degree of hypermetropia, which I knew existed in this case, might be an exciting cause of the episcleritis, I determined to correct it if possible. Atropine was ordered to be used for a week, producing no improvement in the episcleritis. At the end of this time vision was as follows: R. V. $^{6}/_{cc}$ with $+5.5$ D. $\bigcirc +2$ D.cyl. axis $60° = {}^{20}/_{XL}$. L.V. $^{6}/_{cc}$ with $+5.5$ D $\bigcirc +2$ D. cyl. axis $90° = {}^{20}/_{XL}$. Atropine was now discontinued and eserine gr. 1 to ℥i substituted. Within two days there was marked improvement in the episcleritis, and the continued use of the drops for two weeks longer completed the cure. Contrary to my own inclinations I ordered but 1.5 D. spherical added to the cylindrics for this patient as she could wear nothing stronger with comfort.

I know it is the commonly accepted idea that episcleritis is a disease due to a rheumatic or gouty diathesis. In the three foregoing cases I could not discover that there was any predisposition to either of these affections, but on the contrary all gave a history remarkably free from such affections, and antirheumatic remedies were only employed in the first case because I supposed *of course* it must be rheumatism lurking about his system all unknown to the patient, for why else would he have episcleritis. One thing is quite evident in the two latter cases, in both there existed refractive errors, alone sufficient to keep active an inflammatory condition of the eye when once initiated. That refractive errors like hypermetropia and hypermetropic astigmatism will *produce* episcleritis is not for one of my limited experience to determine.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

FRIDAY, JULY 5, 1889. J. W. HULKE, F.R.S., PRESIDENT IN THE CHAIR.

MONOCULAR (?) SUPPURATIVE IRITIS.

[CONCLUDED].

Simple instillation of cocaine is sufficient, and in only two or three cases of enucleation have I resorted to subcutaneous injection. Toxic symptoms will occasionally occur even from simple instillation. The patient will say that he feels queer, his face will be pale and moist. I have never met with any really serious symptoms. For all operations involving the cornea or sclerotic, too much care cannot be exercised, I think, to have the solution of cocaine fresh. My practice is to have it made just before it is required, either with plain water or with salicylic or boracic acid added.

Another point of distinct advantage in the use of cocaine is the saving of time effected. One of my students recently told me that he had calculated that I had occupied just over sixteen minutes in the performance of five squint operations, and that included bringing the patients into the room, laying them on the couch, and their afterward retiring into the ante-room. I was not aware at the time of the calculation, and I need hardly add that previously all the cases had been carefully examined.

In the performance of the ordinary squint operation, cocaine is of very great service. It can often be performed almost, if not quite, painlessly. Down to dividing the tendon sensation

can be avoided if expeditiously performed, and by keeping the conjunctival wound open and dropping the solution into it, over the site of the tendon, it can be completed with but little pain. A general anæsthetic is not required in more than 10 per cent of my cases and then often its administration[1] is limited to a "moral effect" to calm the fears and consequent difficulty in believing that tne eyeball has been rendered so insensitive.

The operation for squint which I have advocated,[2] namely, dividing the tendom from above instead of from below, as is usually done, is of special value when cocaine is employed. The operator is behind the patient, who is thus prevented seeing the instruments, an important point, especially with children. There are other advantages in this method, which I have on other occasions described. I have during the last three years performed it in more than 200 cases.

The present generation has witnessed many improvements in the operation for squint. The objects to be aimed at by operations have become well understood, and though our Board schools and other educational establishments are still busy aiding in manufacturing the article, and the supply is as large, it is the experience of perhaps every operator, that, comparatively speaking, he submits fewer squints to operation than was even a fe.v years ago the case. The reason is easily stated. It is our better knowledge of the relations of optical errors to strabismus, and our increased facilities by retinoscopy and other means of estimating the degree of hypermetropia or astigmatism present, and then of prescribing the appropriate glasses. In this way many cases are cured without operation, and if seen sufficiently early this would generally be the case. Age is hardly a bar to wearing spectacles for this purpose. I have frequently prescribed them for children of three

[1]Cocaine mydriasis passes off under ether or chloroform, whilst that dependent on atropine does not. Cocaine mydriasis must not be relied on for needling lens operations with chloroform.—Vide my note, Brit. Med. Jour. 1885, vol. ii, p. 053.

[2]British Medical Journal, vol. ii, p. 657.

years, and sometimes under, and considering that it is generally after this age that squint commences, there is usually little difficulty in this matter of spectacles. Even in the cases that do come under operation the tenotomy is limited as much as possible, the after-correction of the refractive error being allowed to complete the cure.

A mode of treatment which has come much into vogue in both medical and surgical practice in recent years has also found its uses in ophthalmic cases; I refer to massage. It is true that there is no scope for the many refinements under various names with which massage has beset itself. The mode of employment as advocated on the Continent and in this country by myself[3] is very simple. It consists in rubbing gently, to and fro, and in a more circular manner, the eyelids over the eyeball. The friction may be concentrated chiefly on one spot or be more general, and the surfaces of the eyelids may be rubbed together. Usually a lubricant is used, and vaseline[4] answers this purpose; but, especially in corneal and conjunctival affections, which are so often well treated by massage, the yellow oxide of mercury ointment, made with vaseline, is to be preferred, the value of the ointment and of the massage being made use of at the same time.

Time compels me only to mention in the most general way the cases for which this method is applicable. Corneal and conjunctival affections, chiefly in chronic, but often in acute cases, derive great benefit from massage; generally they should be free from irritability. In the often obstinate cases of episcleritis it is frequently of great service.

Dr. Mules not long since recorded a case illustrating the value of massage in a recent instance of embolism of the central retinal artery; vision was recovered.

A class of cases has much interested me. I refer to traumatic cataracts, and I include among these soft cataracts

[3]Brighton Meeting British Medical Association, 1886; Ophthalmic Review, 1888, p. 134.

[4]Lanoline may be used as a base.

which have been needled. I have no doubt that in many cases the process of absorption is decidedly promoted by massage. It should not be adopted until the eye is tolerably free from irritability. If the opening in the capsule is at all free, softened portions of lens can often be massaged out of the capsule into the anterior chamber, and any portion already there can be moved about in the aqueous. More recently I have made use of massage as a means of ripening immature cataract, especially in cases in which Foerster's operation for maturation has not produced such a rapid development as could be wished. In others the anterior chamber may be tapped before commencing the massage. My experience is too limited at present to speak as to its value in these cases.

Some years since I met in the street an old infirmary patient who had undergone successful cataract extraction in one eye. I asked him when he was coming to have the other eye operated upon. He replied he was "rubbing it off."

The introduction of the electro-magnet[5] for the removal of fragments of steel or iron from the eye may well, I believe, be regarded as one of the distinct gains in recent ophthalmology. It has obtained a firm footing in eye surgery, not only in our own country, but in all parts of the world. That its use has rescued many eyes otherwise doomed to destruction is positive, and equally certain we may be that, if its employment could in all cases be procured early after the accident, the numbcr of failures would be very small. I do not intend to trouble you with details of cases in which the electro-magnet has been employed. I have already put on record thirty-eight such cases, and since then have had thirty-four additional ones, bringing the total up to seventy-two. Out of this number sixty-three fragments were removed from various regions—twenty-five from the vitreous chamber, one from the retina, six from the cornea, ten from the conjunctiva and sclerotic, eight from the iris and anterior chamber, three from the orbit and

[5]British Medical Journal, vol. i, 1881; vol. ii, 1883, p. 937; vol. i, 1885; also Electro-Magnets in Ophthalmic Surgery, 1883.

eyelids, nine from the lens and its capsule, and one from the lachrymal sac.

I am able to introduce to you to-day a man from whom a piece of steel was removed from the vitreous in September, 1880. He recovered perfect vision, and still retains his sight unimpaired, This was my first casc in which an electro-magnet was employed. I can merely add that the nine failures admit of a ready explanation. The specimen shown is from one of these cases; it will be seen that the fragment of steel is firmly embedded in the optic papilla. It is visible on the outer side also, at the point where the optic nerve has been severed at the time of enucleating the globe. It is needless to say that such a case was outside of the range of usefulness of the electro-magnet. In the number of cases mentioned, no account is made of the very numerous probings in recent doubtful cases.

I cannot leave this subject without saying, as I have done on other occasions, that the electro-magnet has uses outside the confines of the eye and orbit. In general surgery cases do occur, in which its employment cannot fail to be of service. Mr. Lockwood, when house-surgeon at the Public Hospital, related before our Medico-Chirurgical Society a case in which with the electro-magnet he had removed a portion of steel from a man's urethra. At the infirmary again, Mr. Staniforth collected a large number of cases proving amongst the casualities its value, including portions of metal imbedded in different regions. I myself witnessed also in a case of my brother's[6] (Mr. J. Snell, Gargrave) its assistance in removing a needle imbedded for some time in the hand. The electro-magnet admits of adaptation to a variety of cases.

Before passing from eye accidents, I may mention that the treatment of sclerotic wounds by suture has in many cases led to the happiest results. I have before now pointed out[7] that it is unnecessary and, for some reasons, undesirable to unite di-

[6]British Medical Journal, vol. i, 1886, p. 1147.

[7]Ophthalmic Review, 1884, p. 300. Trans. Ophth. Society, vol. vii, p. 291.

rectly the lips of the scleral wound. It is sufficient to suture the conjunctiva, for the drawing together of this membrane, the thread, having been passed well under it on either side, pulls together the deeper wound and brings the scleral edges into perfect apposition. By this means, not only is puncturing the sclerotic avoided, but also that of the underlying choroid and retina; the loop of suture, a foreign body in the interior of the globe, and the disturbance incidental to removing such sutures are also done away with. Moreover, in most cases of large scleral wounds, a considerable quantity of vitreous has probably escaped, and the manipulations necessary to pass a needle through the sclerotic unavoidably tend to increase the loss. The conjunctival method obviates this danger considerably.

I am able to show you a youth, whom I treated five years ago, in the manner mentioned. The wound was situated above the sclerotic between the superior and internal recti. The loss of vitreous had been great, and it was still increasing; the eyeball had collapsed, the anterior chamber was nearly filled with blood, and was much deepened by the falling back of the iris and lens. Two months later vision equalled $^{20}/_{LXX}$, and as you see him now—tested shortly before being shown, $V = {}^{20}/_{L}$, and he read J1 easily—he possesses excellent sight, and to outward appearance the eyeball is equal to its fellow.

Such a case as this may well be considered a triumph for conservative ophthalmic surgery. I have selected it to relate rather than a more recent one, partly on account of the severe nature of the injury, but also because of the length of time that has now verified the result at first obtained.

In conclusion, I will offer a few remarks on transplantation of flaps. Ophthalmic surgery is responsible for the introduction of non-pedicled flaps from distant parts. Dr. Wolfe,[8] of Glasgow, has been particularly zealous in advocating this method, and with it his name has now become associated. It is certainly one that it seems to me that general surgeons

[8]British Medical Journal, 1875; Practitioner, 1883.

might find serviceable more widely than has hitherto been the case. Recently Professor von Esmarch[9] has recorded a series of thirteen cases. I have had satisfactory experience of its value in ectropion.[10] The case I am about to relate is not brought forward because of its success with this method, but rather because, in spite of its apparent failure, the result, nevertheless was very satisfactory.

W. H., a little boy, æt. 6 years, was brought to me in February, 1888, in consequence of eversion of the right upper eyelid, which had resulted from an abscess some weeks previously. The eyelid was completely turned inside out, and the swollen, thickened, distended and irregular surface of the palpebral conjunctiva suggested an appearance very much like the crumpled outside of a tomato.

For the purpose of setting the condition right, the following operation was performed. On February 10, ether was administered, and the cicatrix which bound the edge of the everted eyelid almost to the brow was divided, and the dissection contidued until the eyelid was able to be replaced in its normal position. The next step was to fix it in its place, and for this purpose the edges of the eyelids were vivified at their centres, and united to each other by two or three fine sutures. To fill the vacancy left by the restoration of the upper eyelid to its proper place, a flap was taken from the soft skin on the inner side of the boy's right arm. It measured $1^1/_2$ inch long and over half an inch wide. The areolar tissue was separated from the under surface of the flap. It fitted well into the vacant place in the eyelid. It was retained in position by fine sutures, and it was covered with green protective, and over that cotton absorbent wool. On the fourth day the flap looked well, and gave every evidence of vitality. During sleep, however, the next night, the boy unfortunately rubbed off the dressings, and in the morning the flap was found turned up at the edges, and sloughing resulted. Later several small grafts

[9] British Medical Journal, 1889, vol. i, p. 514; Lancet, 1889, vol. i, p. 113.

[10] Lancet, 1882, vol. ii, p. 102.

were transplanted on the granulating surface. But, notwithstanding the boy's arms being tied, and every endeavor being made to keep the patient still, again he rubbed off the dressings. Fortunately, during the whole of this time, the adhesion between the eyelids held good. No little islet of new growth could be detected after the transplantation of small grafts, but it is impossible to say that they in no wise aided toward the formation of the thin cicatrix. The wound in the upper eyelid gradually healed, and as this progressed it showed no tendency to again become everted. The temporary ankyloblepharon undoubtedly in this case contributed most to the satisfactory result, and I think you will agree with me that if the original non-pedicled flap had lived, the result could hardly have been better. In all these cases, therefore, it may be regarded as essential to join the eyelids together, for even by itself this temporary ankyloblepharon will, in some cases, no doubt be sufficient to effect a cure. In the case of this boy the adhesions between the lids became, after a time, just a band in the middle; the eye could be seen well, and he was also able to use it. It was not severed until ten months after the operation.

The transplantation of conjunctival flaps, in cases of adhesion of the eyelid to the eyeball, has rendered very great service. Here also, however, help may be gained in certain cases from distant parts. I have myself, and others have also done so, transplanted the conjunctiva from the rabbit; use for this purpose has also been made of the conjunctiva of another person, or from a recently enucleated eye. In February of last year (1888), a lady consulted me on account of a gradually narrowing socket, which compelled her time after time to procure a smaller artificial eye. The one she had she could no longer wear, and she feared that soon there would be room for none. All this had resulted from the irritation consequent on the continuing, after warning, to use greatly roughened artificial eyes. Examination showed that to one band in particular something could be done. When preparing to operate it was more evident than it had been before that to proceed as I in-

tended, and to transplant or rather transpose the conjunctiva would be robbing Peter to pay Paul, and might possibly end unsatisfactorily. I obtained her ready assent to remove a portion of mucous membrane from the inside of the lower lip. Cocaine rendered this painless, as it did most of the operation in the orbit. The piece from the lip fitted beautifully the place in the socket. It was secured there by two fine sutures. The result was excellent, and she was able again to wear with comfort an artificial eye. I repeated the proceedings a little later in a boy with an extensive adhesion, after a burn, of the lower eyelid to the globe. Here also it was very valuable, as it has also been in other cases.

At the Dublin meeting of the British Medical Association (1887) Mr. Arthur Benson showed some excellent instances of the use of transplanting mucous membrane from the lip in the treatment of ingrowing eyelashes. This suggested to me the use of the mucous membrane in the cases I have related. I afterwards found, however, that it could hardly be termed an original proceeding[11] for it had been performed previously in other lands, as also it has been since.—*Brit. Med. Journ.*

[11] W. F. Smith, Knapp's Archives of Ophthalmology, 1888, p. 430, Meighan's Journal, 1889, vol. i, p. 706.

SELECTION.

ON THE TREATMENT OF IMMATURE CATARACT.

BY ANDERSON CRITCHETT, F.R.C.S.ED., M.A. CANTAB.

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An Address Delivered at the Opening of the Section of Ophthalmology, at the Annual Meeting of the British Medical Association, held in Leeds, August, 1889.

GENTLEMEN.—When the history of the nineteenth century comes to be written in its entirety, the phenomenal growth of scientific knowledge will, I doubt not, be placed upon permanent and honorable record; and, although it represents only a small unit amidst the multitude of the sciences, I think I may venture to claim for ophthalmology that it has not "lagged reluctant in the race."

It is indeed almost impossible for us at the present time to conceive the difficulties which were encountered and successfully overcome by the pioneers of ophthalmic surgery. When we remember the wonderful results which they achieved although unaided by the ophthalmoscope, by any accurate knowledge of optics, by cocaine, by the galvano-cautery, or by the numerous instruments of precision which we now possess, we must indeed marvel, as did the Israelites of old when the mighty giant was laid low by a sling and a stone.

Time has, also, robbed us of most of those who commenced their labors in that which we may perhaps term the pre-ophthalmoscopic, period, and it seems difficult to realize that our honored friend, Prof. Donders, who presided only a year since with such a native dignity and urbanity over the International Ophthalmic Congress at Heidelberg, and whose mental and physical vigor gave promise of days extended beyond the ordi-

nary span, now lives but in the cherished memory of a noble and beneficent career. He has left us the example of a blameless life, devoted not alone to abstract scientific research, but also to the practical development of those great discoveries in optics which have conferred such lasting benefit upon mankind; of him we may indeed say with truth "*Vir nulla non donandus lauru.*"

And now with reference to the work which lies immediately before us, I feel I may congratulate this Section upon the very interesting list of papers which we are promised, and which will, I doubt not, be the cause of much profitable discussion.

I will not intervene at any length between you and so appetising a mental feast, but I desire briefly to allude to a subject the importance of which is, I think, becoming more and more recognized by ophthalmic surgeons; I mean the best method of dealing with immature cataracts. Each one here present, must, I feel sure, have met with numerous cases where not a little hardship has been endured, not only by the individual sufferer, but also by those who are dependent on him where the patient is the bread-winner, when cataract has become so far advanced as to seriously interfere with the pursuit of any occupation, but is not sufficiently mature to render an operation justifiable. A few years since the outlook for such a patient was exceedingly gloomy, for the ophthalmic surgeon, influenced by most worthy and conscientious scruples, could only advise postponement till a more convenient season, which sometimes occupied many years in its advent, until at length hope repeatedly deferred became supplanted by despair, and the unfortunate patient too often drifted into the hands of some unscrupulous charlatan, who robbed him of his already diminished resources under the cover of specious promises which could never be fulfilled. Within the last decade great practical advances have been made in several directions towards a solution of the difficulty, and we may broadly divide the recognized operative method in two classes—that which deals with the immature cataract by immediate extraction, and that which involves an artificial ripening of the lens before its re-

moval. Amongst those who are adherents to the first-mentioned plan I may mention Mr. Tweedy, Mr. Couper and Dr. McKeown. More than eight years since, at Moorfields, Mr. Tweedy removed an immature cataract from a respectable artisan, who had, to no slight extent, forced his hand by declaring that, if no surgical aid could be afforded him, he must enter the workhouse and remain there till the eye was ready for an operation. Referring to this case in May, 1888, Mr. Tweedy writes: "The extraction was uncomplicated, and the lens left the capsule entire. Recovery was prompt, and a few weeks later, with suitable glasses, the patient could read 'brilliant' type quite fluently. Since that operation I have rarely refused to extract a cataract, no matter how immature, whenever both eyes were so affected that the patient was unable to earn his livelihood.

"The success which so far I have had I ascribe entirely to the kind of operation which I have been in the habit of performing—iridectomy, and a peripheral section of the capsule of the lens with the cataract knife, leaving the anterior capsule as far as practicable, intact. By this means the lens is taken as it were, out of a pocket."

Mr. Tweedy claims that any lens matter which is left behind remains within the capsule to which the aqueous humor finds ready access, causing disintegration, liquefaction, and absorption, so that in due time, in the large majority of cases a perfectly transparent capsule remains; while in those rare instances where opaque matter still obstructs the pupillary area a single needle will suffice to tear a capsule, the natural fragility of which has not been impaired by previous instrumentation. In the peripheral section of the capsule Mr. Tweedy was, I believe, anticipated by Dr. Knapp, of New York, who, however, used a cystotome for that purpose, while Mr. Tweedy thinks that a cleaner and better regulated incision can be obtained with a Graefe's knife. Mr. Couper is equally ready to operate on immature cataracts, and claims that he has done so with a large measure of success, but he adopts a plan which is the antipodes both in principle and practice of that mentioned above,

since he introduces a pair of specially constructed forceps into the anterior chamber, and endeavors to remove a considerable portion of the centre of the anterior capsule.

The much canvassed plan of Dr. McKeown, of Belfast, who uses a syringe and warm water to wash the chamber free of soft lens substance, is already known to you, and, although it has encountered much adverse criticism, I believe that it owns some staunch adherents, who are ready to substantiate their opinion by reliable statistics.

These, gentlemen, are the principal methods of dealing directly with unripe and unripened lenses; but Dr. Fœrster's introduction of artificial maturations, is an operative procedure which has already gained the approval and support of not a few ophthalmologists. There is, however, considerable difference of opinion; first, respecting the peculiar forms of the disease in which this method proves especially effective; and, secondly, as to its *modus operandi* upon the lens substance. Thus Foster considers the chief factor to be a mechanical destruction to the layers between the capsule and the nucleus, while Samelsohn thinks that the proceeding produces a change in the lymph stream, resulting in a disturbance of nutrition, and Helfreich seeks an explanation in the mechanical displacement of the individual lens layers.

Time will not permit me to go at length into the minute details of Foster's method, but the subject has been exhaustively dealt with by Dr. Otto Schirmer, who gives the results of numerous experiments. The chief point of difference between Foster and himself is as follows: Foster believes it to be essential to the success of his process that some opacity of the anterior cortex, even though lying very peripherally, must already exist and in this view he is confirmed by Ottinger, who carried out ten trituration experiments in clear rabbit lenses with and without iridectomy, and in no case did any opacity result, in spite of the application of the most varied degree of pressure.

Schirmer, on the other hand, after experimenting on fifty-two rabbit lenses, failed to find opacity in only six instances, and, as four of these belonged to his first cases, he believed

the cause of failure must be attributed to imperfection of proceedure. The other forty-six showed distinct opacity of lens. During the first three hours and sometimes days, this was frequently veiled by deposits of fibrin in the aqueous humor, occasionally consolidated to membranes over the anterior surface of the lens.

The opacification always made its first appearance at the anterior pole, close under the capsule, and by focal illumination an exceedingly fine striation was seen placed radially around the broad, gaping anterior extremity. In a few hours it progressed towards the equator, and its density became increased. Dr. Hess obtained similar results to those just mentioned, except that in every case but one he produced total cataract, which may be attributed to the fact that he continued trituration for three or four minutes instead of half a minute; and this explanation gains probability from the fact that Voelkers, who only momentarily crushed the lens, never obtained a total cataract. The chief dangers of this proceeding seem to be that, if any excessive pressure be used during the trituration, there may subsequently be loss of vitreous when the lens is extracted and also that the process sometimes produces troublesome iritis. Dr. Noyes, of New York, has published the results of Foster's operation in eight cases, all the patients being over 50 years of age. In two instances iritis ensued; in one case of these both eyes were operated on at different times, and both ultimately gave a good result, but severe iritis occurred after each preliminary operation, and again after each extraction. It is to be noted that in this case the cataracts were devoid of all cortical opacity. In the other case iritis with a few synechiæ occurred, but withont any prejudicial result. In all the cases an increase of opacity was observed to ensue immediately but the rate of increase varied in different individuals. Where cortical opacity was already abundant, the effect was prompt and unaccompanied by unpleasant reaction, and in no case did glaucomatous symptoms arise. I believe I am justified in stating that in Great Britain Foster's method of artificial maturation has as yet met with no very general adoption, though

some ophthalmic surgeons, including Mr. McHardy, have given and are still giving to it an impartial trial, and I hope that at no distant date we may be favored with the result of their experiences.

I have endeavored, gentlemen, briefly, and I fear very imperfectly, to place before you the different plans which have hitherto been suggested for dealing with immature cataracts. I do not desire to hold a special brief on behalf of any individual proceeding, though I think it is probable that the best solution of the question will ultimately be found in a happy union of Fœrster's somewhat radical method with the eminently conservative ophthalmic surgery which is advocated by Mr. Tweedy, but I have striven to place the facts judicially before the enlightened and impartial members of this ophthalmic jury, and to leave the issue in your hands. The subject, I am well assured, thoroughly merits our most careful consideration, and although I fear that the time at our disposal will not allow of its discussion on the present occasion, I venture to hope that at some future meeting we shall be able to exchange for our own benefit, and for that of the suffering public, the outcome of an extended research in this particular region of ophthalmology.

DR. JULIUS JACOBSEN, PROFESSOR OF OPHTHALMOLOGY, KŒNIGSBERG. +

Dr. Julius Jacobson, Professor of Ophthalmology at the University of Kœnigsberg, whose death at the age of 61 has just occurred, was perhaps less known in this country than many of his contemporaries. This is due in part to the fact that he appears to have traveled little and seldom to have attended congresses, and in part to the fact that his writings exhibit in a very marked degree those characteristics which render the rapid construing of German so difficult to English readers. Yet his practice and writings have had a great influence on the progress of ophthalmology, and there can be little doubt that to him we owe, in a great measure, the improvement that has taken place in the operation of cataract extraction.

From 1854 to 1857, Jacobson worked with Graefe at Berlin, nominally as his assistant, but the two men were of the same age and standing, and it is evident from Graefe's letters that the relationship was that rather of a friend and colleague. In 1857 he became a *Privat-Docent* at Kœnigsberg; but before settling there he spent a short time with Arlt. In 1872 he was appointed Professor, an appointment which he held till his death.

When Jacobsen went to Kœnigsberg, Daviel's extraction, with large corneal flap, was the operation most practised, but he speaks of having seen the elder Burow perform couching and states that with Junken in Berlin it was still the favorite treatment.

Daviel's flap extraction was probably at this time more successful than it had ever been previously, yet no less than 10% of cases operated on were lost from suppuration alone. Jac-

obsen immediately determined that the first object of his work should be to decrease the loss from this cause. It was the custom after extraction to keep the patient in profound darkness, and not to look at the eyes for some time after the operation; this first inspection must have been an anxious moment, for, if suppuration had taken place, the eye would have passed into a hopeless condition days before. Jacobsen determined to break through this tradition, and for the first five years of his appointment at Kœnigsberg he examined every case of cataract daily by artificial light and focal illumination. The result was that he proved that the suppuration commenced in the cornea, and he believed that it was due partly to the imperfect coaptation of the edges of the wound, and partly to the interlamellar spaces of the cornea being opened. He accordingly shifted his incision into the sclero-corneal junction. The danger of prolapse of the iris was thus increased, and this he obviated by performing an iridectomy, after the extraction of the lens. The situation of the incision and risk of escape of vitreous led him to insist on general anæsthesia, then an entirely new departure in ophthalmic surgery. He described this operation at the Heidelberg Congress in 1864, when he had been performing it for five years, with a loss of only 2% from suppuration —a result so unusual that it appears to have been received at the meeting with a surprise that bordered on incredulity. Graefe, who took part in the discussion that followed, expressed the opinion that, on the whole, iridectomy was disadvantageous. It is evident that Graefe was much impressd by Jacobsen's results, and was becoming less satisfied than formerly with Daviel's operation; and at the end of the year he was studying in London, following the practice of Bowman and the elder Critchett, who were then doing a modification of Waldau's operation, consisting of a lance-cut in the cornea and extraction with Critchett's scoop. We have digressed thus far into a biography of Graefe in order to show the influence of Jacobsen on his practice, for the modified linear operation of Graefe, which has become till lately almost universal, is evi-

dently the natural outcome of Jacobsen's and Waldau's operations.

Jacobsen had none of that false pride which would have led a man of smaller mind to adhere to his own operation; he at once saw the immense advantage of the new proceeding and adopted it. Not only so, but he loyally adhered to it while it was gradually so modified that it is not unlikely that Graefe himself would fail to acknowledge it.

His best known writings are those on cataract, glaucoma, and the connection between affections of the visual organs and general diseases. So recently as last year he published his *Beitraege zur Pathologie des Auges*, and still more recently a paper in Graefe's *Archiv*, giving his experience of cataract extraction during thirty years—a fitting epilogue for an actor who has so nobly borne his part! As the curtain falls, the chief features in the three acts stand out boldly; from 1854 to 1861, 400 Daviel's extractions; from 1851 to 1868, 800 by his own method; from 1868 to 1888, more than 2,500 by Graefe's! —*British Medical Journal.*

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CEPHALALGIA OCULARIA.

BY C. M. CULVER, M.A., M.D., ALBANY, N. Y.

During the session for 1889, of the Medical Society of the State of New York, Dr. Charles A. Dana, Professor of Nervous and Mental Diseases, in the New York Post-Graduate Medical School, who is not a specialist in Ophthalmology read a valuable paper, entitled: "On Chronic Headaches of Functional Origin." The study, represented by this paper, was based on the records of 200 cases. I will quote a paragraph from page 201, of the 1889 Transactions of the above named Society:

"*Ocular Headaches.*—At the present time the eye is credited with giving rise to an immense number of head pains. Their location and character depend not only upon the pathological condition of the eye, but also upon the constitution and occupation of the patient. From my investigations, it seems to me that the most general rule which one can formulate is that headaches from refractive errors are usually frontal or orbital; those from muscular insufficiencies are more often occipital and cervical."

That part of Dr. Dana's paper specially attracted my attention, because it was direct confirmation of the conclusions de-

rived from my own study and practice. It has long seemed to me that the headache produced by general strain of the ciliary muscle, as when a novitiate presbyope insists on keeping his eyes 43 years old until the rest of his body is 46, or when a hyperope makes those muscles do for him what glasses ought to do, that headache is apt to be frontal and orbital. I have seen enough cases in which temporal headache and astigmatism were correlated, to suggest the possibility that such eye-strain as is due to uncorrected astigmatism is causative of that kind of headache. There is a cephalalgia, felt specially at the vertex, that patients have often enough told me was relieved by relief of the eyes from strain, so that it appears to me to be possibly caused by ocular anomalies; but of what kind the latter must be, in order to cause the former, I have not yet discovered. As regards occipital headache, my experience has led to conclusions that are well stated by the above quotation, from Dr. Dana's article. Occipital headache is most often produced by lack of positive convergence power.

On page 276 of Treat's "*International Medical Annual*", for 1889, Dr. Dana has published this: "Perhaps the most important contributions to the therapeutics of headache and migraine of late are showing relation of these troubles to ocular disorders. As a matter of course, hyperopia nearly leads its class as a producer of headache." Dr. Noyes[1] says: " * * * in many, hyperopia is the couse of chronic headache."

Meyer[2] writes: "thus, by simple inspection, without having recourse to examination with glasses, we can often detect a pronounced hypermetropia. Again, patients never fail to tell us that they do not see so well near at hand as at a distance, and that their eyes get very easily tired when their work requires close application. This feeling of fatigue in the eyes is accompanied with pains in the periorbital region and sometimes with headache."

[1] Noyes, "Disease of the Eye," page 59, line 7 from bottom.

[2] Meyer, "Disease of the Eye," page 429, line 7.

Mr. Frost[3] writes: "Actual defect of near vision is seldom complained of except by hyperopes whose ametropia is of high degree, or who are over 30, and whose accommodations has consequently become impaired. The symptoms arising from excessive efforts are much more common. These consist in an inability to read or work for long together, especially towards evening, pain and conjunctival injection on making the attempt, and headache always brought on by prolonged use of the eye. Occasionally this headache is the most prominent, or the only symptom."

Again, in the same treatise,[4] we find: "When the inequality between the internal and external recti is considerable, or when, with even a slight inequality, the general tone is lowered the attempt to fix both eyes upon a near object for any length of time gives rise to a feeling of fatigue and sometimes to headache, symptoms, in fact, which are similar to those produced by hypermetropia."

At the last meeting of the American Ophthalmological Society, Dr. Myles Standish, of Boston, read a paper on partial tenotomies. The *American Journal of Ophthalmology*[5] says of this: "The author reported five cases in which he had performed this operation on account of constant headache, inability to use the eyes and neurasthenic symptoms. In all but one there was prompt relief of the local and general symptoms by the operation."

I should be inclined to say that evidence of the production of headache by ocular anomalies is to be found in every good book on general ophthalmology, but for the fact that, in lately studying this subject, I have consulted standard works on eye-diseases, without finding what I sought, that is, mention of ocular headache. But I still think that the reason why I have not found such memtion in some of the books just alluded to, is that I have not looked in the right place; because, I see no

[3] Frost, in Carter and Frost's "*Ophthalmic Surgery*," page 406.

[4] *Ibid.* page 463.

[5] *American Journal of Ophthalmology*, August, 1889, page 252.

reason why my experience should differ from that of the average ophthalmic practitioner, and, though I think I never led up to that topic in examining eyes, headache is being constantly given, as a part of my patients' subjective history, and the relief of it, by ophthalmic treatment, is a gratifying feature in much of my practice.

In the *American Journal of Ophthalmology*, Dr. Thomas Featherstonhaugh [6] has reported a case of insufficiency of the externi; a part of the report reads: "The subjective symptoms which led him to seek advice were pain in both eyes and head." * * * * The treatment was by means of tenotomies of preponderant interni. A part of the statement of the result, is this: "I have lately received a letter from this patient, in which he says that he has been able to use his eyes as freely as any of his friends; that he studies hard without the least sense of discomfort, and feels confident that the eye question, so far as he is concerned, is solved." Of course, the head pains, referred to, in this report, constitute the part to which I would now especially call attention.

Again, I propose citing ten of my own cases, wherein headache has been relieved by treatment directed to the patient's eyes.

Case I. (907). Mr. H. P. A., æt. 19 years, consulted me July 13, 1887. He had first written me an account of his headache and asked if I could relieve it. I have a copy of my answer, and would cite it as merely giving a statement of my "platform" relative to such cases, but for the facts that it would too much protract this writing, and has no special bearing on the matter under discussion. In that answer, I said, as courteously as I could, that no subjective history alone, could be of the same value to a physician, as a direct examination. That, from his account, it seemed highly probable that an oculist could best serve him; but that I could not promise a cure; that, in my experience, the irresponsible physicians were most profuse with

[6] Featherstonhaugh *American Journal of Ophthalmology*, November, 1886, page 327.

promises, while the trustworthy ones were most careful about encouraging prognostication when they had no opportunity to make a thorough examination. In the patient's first letter, he wrote that he had "had very severe headache often, for the past two years; pain in eyes, especially after having done near work." In the summer of 1885, a colleague had prescribed, for each eye, a cyl. + 0.50 D. axis 90°. I found the refraction of the patient's eyes such that these glasses were beneficial so far as their effect went. In the autumn of 1885, Dr. Thomson, of Philadelphia, had used atropia for three days in patient's eyes, and had prescribed for each, sph. + 0.50 D. $\bigcirc$ cyl. +0.50 D. axis 90°, and the patient had worn those glasses for six months. I assured the patient that if anybody knew what his eyes needed at the time of that examination it was Dr. Thomson. I wrote to Dr. Thomson, asking whether those glasses were designed to be a full, or only a partial correction of the ametropia. Dr. Thomson's reply assured me that the correction afforded by the glasses, was full; accordingly, I told the patient that those glasses could not be improved on, and that he would do well to wear them constantly, until their acceptance for all distances was complete. I found the positive convergence abnormally restricted; as I do not think Dr. Thomson would have disregarded such an anomaly, had it been present when he corrected the ametropia, I assume that it had arisen in the interval between his examination and mine. My record of the treatment advised, reads: "To wear Dr. Thomson's glasses all the time; and to practice orthoptic training of the interni, by prisms and directly, according to directions given." (Such directions concerned the fixation of a prominent object which was being approached to the eyes, in the median plane of the body; such exercise was to be given to the interni ten minutes at a time, each morning and evening, until nine metre-angles of positive convergence were feasible.) On August 1, 1887, the patient wrote to me: " * * * * since wearing my glasses again I have noticed a marked improvement in my headache." Ten days later he wrote that he had more than trebled his positive convergence, as measured by the adducting

prisms whose action his eyes could overcome, while fixing a candle, 6 metres distant, and added: "Think my head is improving still." On September 7, 1887, he wrote to me from a summer-resort in Pennsylvania, reporting ability to use 9 metre-angles of positive convergence (measured as above stated) and added: "My head is much improved and I am here in order that the bracing mountain air may effect an entire cure."

CASE II.—(1388.) Mrs. E. J. C., æt. 29 years, consulted me December 3, 1888. The subjective history included: "Think that eyes make headache." I found a simple, hyperopic astigmatism of each eye, and prescribed for each a Cyl.+0.75 D. axis, 90°. Having heard, several months later, from another patient, that Mrs. C. had experienced considerable relief from headache, as a consequence of the optical prescription I made in her behalf, I lately wrote, asking her to tell me concerning any effect that treatment of her eyes had seemed to her to have, in the diminution of her headache. Following is the chiefly pertinent part of her reply: "I have suffered from both sick and nervous headache for about twenty years. No medicine ever seemed to help me for any length of time. Could never go out in the morning, or take a pleasure trip, no matter how short, without suffering for hours with headache. Since December, 1888, when I began wearing glasses prescribed by you, I have had very few headaches; it is now nine weeks since the last attack."

CASE III.—(939). Miss K. M. G., æt. 14 years, acted on a suggestion from Prof. Cady Staley, and, on August 2, 1887, consulted me, regarding her eyes, giving a subjective history of "much headache, when at school." There was also, as is comparatively frequent, in cases of similar refractive errors, a history of asthenopia, nervousness and insomnia, but, as these do not bear on ocular headache, will not receive further attention herein. Each eye had compound, hyperopic astigmatism of the correction of which I prescribed only the cylindric portion since she was young and fairly robust; without glass or mydriatic, each eye had V.$<{}^{20}/_{\text{L}}$. With a Cyl.+0.75 D., axis 90°, each had V.$={}^{20}/_{\text{XX}}$ of Snellen vision. On November

19, 1887, Miss G. called on me; the report of that call in my case-record, contains this: "Patient reports great benefit from my prescription for her; she no longer has sore eyes or headache." An interesting part of that report was that she had been obliged, a short time previously, because of having facial erysipelas, to lay aside the spectacles, for a time; the headache and asthenopia then resumed their sway, but surrendered again, when the spectacles were again donned. I last saw the patient on September 11, 1889, when the report was quite as favorable, there having been no recent trouble from headache; near work, when long continued, had again become irksome to her eyes, and she then accepted and I prescribed the complimentary spherical lenses.

CASE IV.—(1340). Miss M. E. W., æt. 16 years, consulted me May 31, 1888 The subjective history, then given, reads: "Has much headache; general health is poor. Has all three kinds of eye-headache; temporal headaches predominate. Pupils have been unnaturally dilated. Is very nervous." Without glass or mydriatic, the right eye had Snellen vision of $^{10}/_{cc}$; with Sph.—3.50 D.⌣Cyl.—0.75 D., axis, 90°, V.=circa $^{20}/_{xx}$, (read all of some 6-metres lines, but not all of others). Without glass or mydriatic, the left eye had $^{12}/_{cc}$ of Snellen vision. With Sph.—2.75 D.⌣Cyl.—0.75 D., axis, 45°, vision was about $^{20}/_{xx}$. I prescribed the cylindric lenses, just named, each in combination with a spheric—1.50 D. On July 25, 1889, the patient called on me, and reported that, since I had prescribed for her, she had not had "nearly so many headaches." I then found that considerable myopia had been acquired since she first consulted me, and I increased the minifying strength of the spheric part of the lenses first prescribed by me for this patient by 2.50 D.

(Let me say, parenthetically, that, although I do not yet quite concur with Dr. Edward Jackson, concerning the full correction of real myopia. I have so high an opinion of his judgment that, at my solicitation, he prescribed the glasses which now adorn my visage, and a discussion which he and I had, on July 19, 1889, while walking from The Polyclinic to

his consultation-rooms, has led me to approximate such full correction, at least experimentally, more nearly than I had formerly done.)

Thinking this an illustrative case of ocular headache, I wrote to Miss W., asking her to tell me, 1st. If she had formerly been much troubled with headache. 2nd. If she thought that the treatment, which her eyes had received, had resulted in relief of her headache; and 3d. How much that relief had amounted to. The reply reads: "I was troubled constantly with severe headaches, so that I was never really free from them, for about two years, till I put on the glasses you prescribed for me, when, for a time, I was not troubled at all with headache. But, within two or three months of your second prescription, the headaches returned, though they were not so severe as formerly; but the glasses relieved me, and I am now almost entirely free from headache."

Case V.—(1334). Mr. J. T. Y., æt. 25 years, consulted me May 24, 1888; headache was the prominent symptom complaimed of; he gave this history: "In school, eyes became very tired; five years ago, got a bit of oat-chaff in right; it grew on; then left couldn't read; left eye is of no benefit. Dr. Bontecou, of Troy, removed chaff. In 1885, consulted an ophthalmological colleague, who prescribed reading-glasses; these tired eyes. Dr. G. Lyon, his physician, reports to me, as on the patient's part, non-mastication, overwork, indigestion and constipation." I found nothing wrong with the cornea of either eye; the right had V.$<{}^{20}/_{\text{xx}}$, without glass or mydriatic; it had a trifle better vision when a Sph.+2.50 lens was before it. Without glass or mydriatic, the left eye had V.$<{}^{20}/_{\text{c}}$, but this was increased to ${}^{20}/_{\text{LXX}}$ by a Sph.+4.00 D. I prescribed Sph.+2.50 D., for the right, and Sph.+3.00 D. for the left eye. On September 5, 1889, he reported that he had "had but very little headache and constipation since I prescribed glasses."

Case VI.—(1705). Mrs. R. This case had been reported to me earlier, and casually, by Dr. A. O. Roberts, of West Sand Lake. July 24, 1889, this gentleman brought the patient to con-

sult me. At that time, the subjective history was: "Near work makes eye-balls pain very much; has always been subject to headache, since she can remember." Koroscopy showed me that each eye was hyperopic, vertically by 0.50 D., the right eye horizontally by 0.75 D., and the left, horizontally by 1.00 D. Without any glasses, the patient had normal, distant Snellen vision, but this was improved by Sph.+0.50 D.⌣Cyl.+0.25 D., axis 90°, for the right, and Sph.+0.50 D.⌣Cyl.+0.50 D., axis, 90°, for the left; with both these glasses, saw Snellens 6-metres letters, at 6 metres, "splendidly" (*ipsa dixit*) and with either eye, alone, as well as with the other. On September 24, 1889, patient reported that the eyes had felt "ever so much better" since I had prescribed for them (the prescription having called for just such glasses as are above described). "Headache has been much bettered." But she gave an account of having had "two real hard headaches;" had gone to a pic-nic without the glasses, and in half an hour, had had a headache. On September 24, I found inability, on the part of the *externi*, to overcome the action of any abducting prism; orthoptic training was therefore prescribed and is not yet concluded; at the time of the first call there had been esophoria of 1.50 minimum-deviation degree. While the headache, in this case, has certainly not yet been entirely "cured," by eye-treatment, it still seems to me illustrative of the points the truth of which this writing seeks to demonstrate.

Case VII will be a continuation of the history given on pages 192 and 193 of the issue of The American Journal of Ophthalmology for June, 1888. Miss F. and her father called on me September 19, 1889. Mr. F. said that the patient had lately broken the spectacles that I had formerly prescribed for her; the repairing of them had required her non-use of them for about a day, during which time the headaehe and nausea, which had annoyed her before I had prescribed for her, and not returned between the times of that treatment and of the spectacle-fracture, had returned and troubled her, just as formerly. Resumption of the spectacles, when they had been re-

paired, had caused the disappearance of the nausea and cephalalgia.

CASE VIII.—(642). Miss M. V., æt. 13 years, consulted me November 1, 1886. There was simple hyperopic astigmatism, in each eye, and a history of "headaches after using eyes." On the 24th of the same month, (the patient, in the interim, having worn convex cylinders, prescribed by myself) Miss V. and her mother both reported to me that the patient had had entire relief from her headache. (Parenthetically, again, I would say that there are other, so interesting points, in the history of this case, that, in not reporting them, the writer resists a temptation; the most recent report from the patient, was as satisfactory as any has been; but certain things have happened, to the eyes in question, that, not very long ago, I would have pronounced incredible or impossible. The reason, for not reporting these interesting points, is that they and ocular headache are not especially correlated.)

CASE IX.—(707). Mrs. S. A. S., æt. 29 years, acting on the advice of Dr. S. A. Russell, consulted me December 27, 1886. The recorded history reads: "Has had headache for 13 years; had some spinal trouble 4 years ago. (At that time, for 3 months, could not read a line.) General health fairly good at present. Is a teacher and, on dark days, feels 'eye-strain' in school-room; this is always followed by (and, patient says, 'produces') headache." Both eyes, without glass or mydriatic, had, at time of consultation, Snellen vision of $>{}^{20}/_{\text{XXX}}$; either eye, under like conditions, had V.$={}^{20}/_{\text{XL}}$; during complete mydriasis, both had V.$={}^{20}/_{\text{LXX}}$; right same as both; left, V.$={}^{20}/_{\text{L}}$; with a cyl.$+1.25$ D., axis 90°, for the right, and a cyl. $+1.50$ D., axis, 90°, for the left, either eye had V.$={}^{20}/_{\text{XX}}$. On November 21, 1887, the patient wrote: "My eyes seem much better." She further refers to the use of Atropine discs, which, in order to expedite the acceptance of the glasses, I had prescribed for weekly use, and adds: " * * * on Saturday, following their use, could see distant objects very distinctly, with my glasses, and on Sunday could read with ease and without headache being the result." Some weeks

after the consultation, Dr. Russell told me that the glasses prescribed had quite relieved patient's headaches.

Case X.—(1684). Miss I. G., æt. 17 years, consulted me July 1, 1889, acting on the advice of Dr. A. O. Roberts, of West Sand Lake. As subjectively stated, patient had had some photophobia, at first; had worn dark glasses and gotten rid of photophobia. Had had some dimness of vision. Had headache, she said, "about all the time." Simple astigmatism, corrected by cyl.+0.50 D., axis 90°, was found in each eye, and such a lens prescribed for each. On September 2, 1889, patient reported favorably of my treatment; the headache had been much relieved by the use of my prescription; "but, for last three weeks, has had headache." On examination, I found spasm of the ciliary muscle of each eye, and prescribed five centigrammes of sulphate of atropia, to twenty grammes of water, a drop of which weak solution was to be instilled in each eye every evening. Just two weeks later, she reported that, during the interval, her head had not ached at all.

As stated in the peroration of my previous article on this topic, I consider ocular headache a matter worthy of further discussion. "Stomach-headache" has become a "household word;" we only rarely hear, except from our colleagues, any mention of headache of which ocular anomalies are productive. As before said, of this subject, "my present purpose is to discuss it further, in the future." But if that be done at all, it will probably be in a manner somewhat differing from the present one; that is, I prefer to give histories of cases, with the treatment of which I have had nothing to do. Some colleagues have promised to furnish such histories.

Again, it is my purpose to trace out the connection between eye-strain of the different kinds, and the various forms of cephalalgia resultant thereon.

RETINITIS PIGMENTOSA TREATED BY INJECTIONS OF STRYCHNINE.

BY S. C. AYRES, M.D., CINCINNATI, OHIO.

Carrie B., æt. 11 years, was first seen about two years ago. At that time she was very amblyopic, her vision being 0.1 in the right eye, and 0.2 in the left. Her field of vision was markedly contracted in both eyes, and although she was going to school, it was with great difficulty she was able to study.

The retina presented the characteristic alterations which are seen in pigment infiltrations. The optic discs were very much blanched and the large vessels were smaller in caliber than normal. There was also a circumscript choroiditis in both eyes.

Her health has always been delicate and her physiognomy is characteristic of the inherited specific type, the upper incisors are notched and the corneæ have a cloudy appearance although she never had interstitial keratitis.

At present her vision in the right eye is reduced to bare perception of light, the optic disc is very much blanched and the large retinal vessels appear like mere threads upon it. In the left eye the vision is about what it was two years ago (0.2), but her field of vision is very much more contracted, the vessels on the disc are very much smaller than normal and the capillaries have entirely disappeared. Her field of vision is so contracted that she cannot walk around in a room with ordinary light, without stumbling over chairs and tables. On a cloudy day or at twilight she has to be led. This contraction in the field of vision has increased very considerably within the past year.

Knowing the influence of the hypodermic injections of strychnia in cases of atrophy in toxic influences, I determined to

try its effects in this case, and began the use of $^1/_{24}$ of a grain. I did not tell her what influence it would have but waited for her to tell me what her sensations were.

Before beginning its use, her vision was tested with the perimeter and found to be 10° in all directions. In three days she remarked that she was able to see objects in the room better and was able to walk in the hall which was moderately well lighted, without assistance, a thing she could not do when she came.

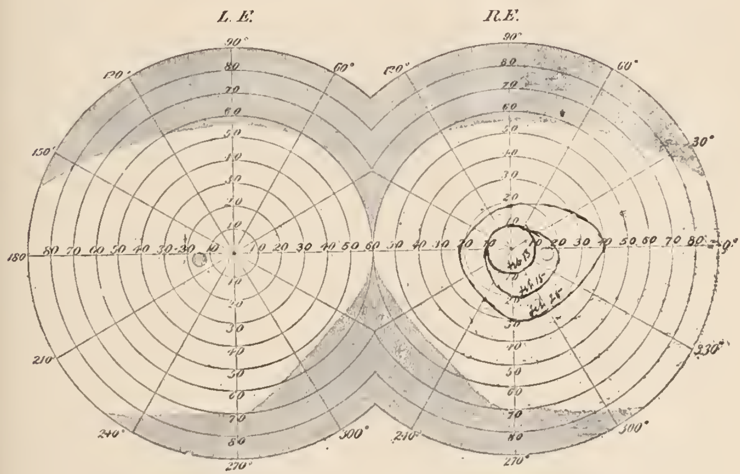

FIG. 9.

Her field of vision was again tested and was found to have increased to 20° downward and outward. The hypodermic injections were continued for ten days longer when the test of her field of vision was again taken and it had increased in all directions; directly upward it was 20°, inward 22°, outward it was 40°, and downward 30°. This increased field of vision gave her much more comfort in walking around and seeing objects in the room as well as enabling her to walk with more security on the street. Her central field for reading was markedly improved also.

Before the strychnia was used she was able to read Snellen $3^1/_2$ slowly, but when she left she was able to read $1^1/_2$ with as much ease as she had read $3^1/_2$ at first. Her face had a different and more intelligent expression and she was enabled to walk with greater security.

There was also some improvement in the left eye; when she came she was barely able to see shadows of the hand, but before she left she was able to count fingers a few inches from her face and the amount of improvement on that side was a source of great relief to her. It is not likely however that it will ever be increased beyond what it is now.

In the transactions of the American Ophthalmological Society for 1886, Dr. Hasket Derby contributes some interesting observations on "The Possible Retardation of Retinitis Pigmentosa by the use of the Constant Current Battery." The results are very encouraging and quite sufficient to justify us in giving every such case the benefit of the doubt.

These cases have been long enough classed among the incurables and if there is any benefit to be derived from electricity or strychnine they should have it. I have seen such excellent results from the use of strychnine in toxic cases where the disc presents a very similar appearance, that I thought it a fair case to treat.

Two years previously she had been sent home without any treatment and there was a marked narrowing in the field of vision.

We are not encouraged to treat these cases by the text-books. The latest one out says "no treatment can be said to be of the slightest avail." This is only one case and proves nothing, but it certainly encourages me to hope for more good results in other cases.

A FATAL CASE OF PHLEGMONE OF THE ORBIT.

BY ADOLF ALT, M.D.

Although the number of cases of phlegmone of the orbit that have come under my personal observation is decidedly up to the average, I have so far only once been unlucky enough to see such a case end fatally in spite of all endeavors.

On October 5, 1888, I was called to see in consultation, D. S., æt. 40 years, a strongly built man. He was then reconvalescent from a pneumonia which had attacked him some six weeks before. I was told by the physician in attendance that four days previous to my visit the right lid had become swollen, the eye had become protruding and the patient had complained of headache. In spite of an application of iced compresses and of nitrate of silver to the conjunctiva, the condition had not improved.

After having heard this history I was no little astonished to find an enormous exophthalmus of the right eye. The lower lid was perfectly everted, the upper lid barely covered one-third of the cornea. The cornea was "steamy," and the iris and lens seemed to be so closely pressed to its posterior surface, that no anterior chamber could be made out.

The swollen lids were of a dark, purplish color. Neither the eyeball nor the lids could be moved and were stone hard. V=o. In spite of a careful palpation no trace of fluctuation could be detected.

I had the patient at once moved to the hospital and hot applications applied to the eye continually. This seemed to relieve the patient considerably, and two days later, on the 7th, the eyeball could be slightly moved and on palpation fluctuation could apparently be easily felt in the upper inner part of

the orbit. I then made a deep incision into the orbital tissue in that region, enlarged it and probed to the depth, but without getting at any pus. The pretty free bleeding seemed, however, to relieve the patient, and when I saw him toward evening of the same day, he declared that he felt considerably better, and could move the eyeball and upper lid to a limited extent. I kept the wound open, had it frequently irrigated with a sublimate solution, and the warm compresses continued.

The night after the incision the patient became delirious and had a high fever. Toward morning the delirium passed away and the fever disappeared almost totally under the influence of antipyretics. The next day the swelling of the lids and the exophthalmus were markedly improved and a piece of necrosed tissue was visible in the conjunctival wound. After its removal a small amount of pus could be pressed out of the orbit. The patient stated that he was feeling much better, even his headache had gone. He was in a moderate sweat, but his temperature was above normal.

The next day, on the 12th, in the afternoon, we were hastily called to the patient. He had had a sudden collapse and the nurses had thought him dying. We found him evidently in a dying condition. His face was pale, his lips blue, the extremities cold, the pulse small and very frequent, respiration laboring. The patient was semi-unconscious and unable to speak, although he would attempt to do so. He had, moreover, incessant clonic spasms of the muscles of the limbs and arms. In this condition he lingered on, unchanged, in spite of medication, and he died during the night of October 14.

The post-mortem examination, which was made the next day, confirmed the diagnosis of purulent meningitis, especially at the base of the brain. No macroscopical connection between the small pus cavity in the orbit, behind the eyeball, and the pus in the meninges could be found.

PRESIDENTIAL ADDRESS ON OPHTHALMOLOGY AND GENERAL MEDICINE.

BY J. HUGHLINGS JACKSON, M.D., F.R.C.P., LL.D., F.R.S.,

Physician to the London Hospital, and the National Hospital for the Paralyzed and the Epileptic.

Delivered before the Ophthalmological Society of the United Kingdom.

No professional honor could be more pleasant to me than is the Presidency of the Ophthalmological Society. I thank you for it with all the greater heartiness because I am already very much in your debt for your selection of me to deliver the Bowman Lecture of 1885,[1] and to open a discussion on that most important neurologico-ophthalmological subject, optic neuritis.[2] There is no department of medicine which has greater attractions for me than ophthalmology has. It was the first subject I specially worked at after my student life, and I still think what I said when giving the annual address, 1887,[3] before the Medical Society, that it was "the luckiest thing in my medical life that I began the scientific study of my profession at an ophthalmic hospital." Many years ago I had the good fortune to be Mr. Hutchinson's clinical assistant at Moorfields. I suppose it is to his example and teaching that I owe the beginning of the little scientific development I may have. At an ophthalmic hospital one has the opportunity of being well disciplined in exact observation. When a physician sees how carefully and precisely ophthalmic surgeons investigate the

[1]Trans. Ophth. Soc., vol. vi.

[2]Op. cit., vol. i.

[3]Ophthalmology in Its Relation to General Medicine. British Medical Journal, May 12, 1877, et seq.

simplest case of ocular paralysis, he is getting a lesson in exactness, and will be less likely in his own department of practice to deal in such generalities as that a patient's seizure "had all the characters of an ordinary epileptic fit," and more likely to take pains to describe the convulsion, the place of onset, the march and the range of the spasm. I suppose I must have felt myself under the kind of discipline mentioned when I wrote about twenty-three years ago:[4] "Until physicians work at the muscular disorders of various convulsive seizures as carefully as ophthalmic surgeons do at paralysis of the ocular muscles, our knowledge of convulsions will not advance in an orderly way." One meaning of science is exactness, or, as Dr. Buzzard put it in suggesting a name for a celebrated painting, "science is measurement." The ophthalmic surgeon measures the swelling of the discs in optic neuritis, the degree of error of refraction in hypermetropia, astigmatism, etc., and makes exact charts of the field of vision.

Although I do not congratulate you on your present choice, I think it a good thing that the President of this Society should sometimes be a physician. It will encourage physicians, especially young physicians, to work earnestly at the ophthalmological aspect of cases of patients under their care. By doing so they may repay part of the great debt to ophthalmology which general medicine, and especially neurology, is under. Part of this debt has been paid by Charcot, Westphal, Weir Mitchell, Gowers, Clifford Allbutt, Ferrier, Seguin, Stephen Mackenzie, Bristowe, Wilks, Sharkey, Edmunds, Herbert Habershon, Samuel West, James Anderson, and many other physicians. I would particularly mention Gower's magnificent work Medical Ophthalmoscopy, a work esteemed by neurologists throughout the world. The recent researches of Beevor and Horsley on localization of ocular movements in a particular region of the cerebral cortex of monkeys is an important contribution to ophthalmology as well as to general medicine and surgery.

[4]Roy. Lond. Ophth. Hosp. Rep., vol. v, part 4, p. 268

Since six cranial nerves and the sympathetic nerve supply the eyeball and its apparatus, it is evident that, without a good knowledge of eye diseases, the thorough investigation of very many morbid affections of the nervous system is not to be methodically carried out. It is easy to show that this statement is by no means a mere truism. Unless the physician uses the ophthalmoscope by routine, he will often enough overlook the best evidence—and I am convinced in some cases the only decisive evidence—of gross organic disease of the brain there is to be had; and if, as is most often the case in a physician's practice, sight be good, he will not surmise that there is anything wrong with his patient's optic nerves, and will very likely be incredulous when someone who has looked at them tells him that there is swelling of the discs. It is not very many years since the ophthalmoscope was rarely used except by ophthalmic surgeons. Dr. John W. Ogle was the first physician in this country who used the instrument in the investigation of medical cases. I think it very unlikely that there is to-day a single patient in the National Hospital for the Epileptic and Paralyzed whose eyes have not been examined by this instrument.

I was very much struck by the frequency with which Dr. Macewen, of Glasgow, mentioned optic neuritis in his paper, "The Diagnosis, with Especial Reference to Localization of Intracranial Lesions, the Result of Aural Disease," read at the Leeds meeting of the British Medical Association last August. This paper is a most valuable contribution to ophthalmology, otology, and surgery. I urge young physicians to study eye diseases at an ophthalmic hospital or at an ophthalmic department of a general hospital; this nowadays needs no urging on physicians especially interested in neurology. A superficial knowledge will not suffice. Without special knowledge of ophthalmology a medical man may overlook paralysis of a superior oblique muscle altogether—may not know that there is any eye trouble at all; if so he will misinterpret the vertigo for which his patient consults him. The physician's ophthalmological knowledge should be wide. A neurologist who

thought only of those ocular symptoms which pertain to the nerves of the eye and their centres would be thinking too narrowly for practical purposes. Unless more widely trained in ophthalmology, he would overlook hypermetropia as a cause of headache and other nervous symptoms, and might thus treat by drugs a condition only needing spectacles for its cure. Again, the physician may, if he does use the ophthalmoscope, misinterpret what he sees if he does not know the morbid results of strain of hypermetropic eyes on the optic discs; he may erroneously consider swelling of the discs due to hypermetropia as a neuritis signifying serious brain disease, and treat the patient on that hypothesis. I infer that there is some excuse for this mistake when made by a physician, and I confess that I have made it, as I have known more than one highly accomplished ophthalmic surgeon to be, for a time at least, in doubt in such a case.

I hope I shall be pardoned for making one more quotation from the address delivered before the Medical Society; I repeat emphatically that "without a good knowledge of ophthalmology a methodical investigation of diseases of the nervous system is not merely difficult, but impossible."[3] Indeed, no physician will, I submit, doubt this who reads Mr. Swanzy's Bowman Lecture, printed in our forthcoming volume of Transactions, a most able and very valuable contribution to both neurology and ophthalmology.

I speak again of optic neuritis with gross organic brain disease. I suggest that cases of uniocular neuritis with tumor of one cerebral hemisphere (I have only seen three cases with necropsies) are the cases which, after microscopical examination of the parts concerned, will throw most light on the process by which optic neuritis results from disease of various parts of the encephalon. These cases are most likely to come under the care of physicians. The discovery of this process will be a great gain, not only to ophthalmology but to neurology also. For, presumably, the process by which the patho-

[5] British Medical Journal, May 12, 1877, p. 575.

logical condition for some other symptoms, occurring in cases of gross organic brain disease, is produced is similar. At present there are only hypotheses as to this process. I find that I am sometimes quoted as having concluded that optic neuritis results by vasomotor action, whereas I have only said, what I still think, that that hypothesis seems to me to be the most plausible of the three hypotheses I spoke of.[6] I would remark that an adequate hypothesis has to explain not the neuritis only, but some other pathological conditions, also produced by intracranial tumors. We may put for answer the more general question: How does a tumor, say of the cerebral hemisphere, produce symptoms not explainable by its destructive action? It is well known that some patients, subjects of optic neuritis, and who for most of their time see well, have frequent temporary losses of sight. It is very remarkable to observe a patient stagger into one's room quite blind and then to find him next minute seeing quite well, although with double optic neuritis. Dr. Samuel West has recorded in our Transactions, vol. iii, p. 136, a valuable case of the kind. So striking and so very definite a symptom demands explanation as much as do epileptiform seizures, which often result from the same tumor of the mid-cortex which produces double optic neuritis. Neither of these paroxysmal symptoms can be put down to the destructive action of the tumor. I submit that they depend on diametrically opposite changes; that there is exalted instability of cortical grey matter—a condition induced by the tumor, probably by a local encephalitis, a condition permitting occasional sudden excessive nervous discharges. An acceptable hypothesis has to account for these two symptoms as well as for optic neuritis. It has still more to account for.

There are other symptoms sometimes occurring along with optic neuritis from intracranial tumor which require explanation; and this I hope physicians will endeavor to give. Dr.

[6] Trans. Ophth. Soc., vol. i, p. 90.

Buzzard[7] made the following remarks: "Was it possible * * * that the vomiting and the slowing of the pulse might represent an affection of the pneumogastric brought about by the same cause as that which produced optic neuritis, and that the sudden or rapid death which Dr. Hughlings Jackson had mentioned as one of the possible contingencies of optic neuritis from intracranial disease might also be explained by a more severe influence exerted upon the same nerve?" It is very remarkable that many patients with optic neuritis die suddenly or rapidly, and when seemingly in fair general health, sometimes at work, certainly most unexpectedly. I have often urged this on the attention of physicians. In some cases of cerebral tumor the patient may be acutely ill; he may have an illness very like tubercular meningitis in many of its symptoms; there may be slow and unrythmical pulse and irregular respiration; there are retracted belly, constipation, and vomiting. I suppose that when a patient who has post-neuritic atrophy tells us that his sight failed after "bilious" or "gastric" fever, he has had such an acute illness. Dealing with certain cases of optic neuritis in children, Hutchinson wrote:[8] "Nearly always there is a history of a severe illness, which was supposed to be fever, and was marked by delirium and other head symptoms."

The organic, or, as one may call them, the "vital" symptoms I have mentioned, are of great importance to the physician. Speaking figuratively, a cerebral tumor in producing optic neuritis is trying to make the patient blind; in producing the other pathological conditions, those of the "vital" symptoms, it is trying to kill him. Following up Dr. Buzzard's very luminous suggestion, I advise that when a patient with optic neuritis dies suddenly or rapidly or dies in an illness with the "vital" symptoms mentioned the medulla oblongata as well as the optic nerves and tracts should be searched microscopically. There is, however, something to be said against the location of

[7]Trans. Ophth. Soc., vol. i, 1881, p. 98.

[8]Roy. Lond. Ophth. Hosp. Rep., vol. v, 1866, p. 307.

the changes under remark in the medulla. It is perfectly certain that the organic parts, although represented directly in the medulla oblongata, are indirectly represented (represented over again or re-represented) in the mid-cortex of the brain; hence it may be thought the "vital" symptoms spoken of are owing, not to morbid changes induced in the medulla, but to such changes provoked by the tumor in the cortex in its neighborhood, especially as it is unquestionable that the tumor does produce the changes round about itself on which epileptiform seizures depend. This I think unlikely, especially when the tumor is in one-half of the brain. I now wish particularly to mention that, as Fagge[9] pointed out, some patients die of cerebral tumor by rapid respiratory failure. In one case under my care artificial respiration was tried, so respiratory, so to speak, was the condition. I cannot but think that in death by failure of respiration in cases of intracranial tumor there have been morbid changes akin to optic neuritis induced in the respiratory centres of the medulla oblongata. It must be borne well in mind that, strictly speaking, optic neuritis is not a symptom, although it is the custom to call it one, but a pathological condition; often enough it exists without any symptom (defect of sight) attending it. Hence it compares, not with convulsion and the "vital" symptoms, but with the pathological conditions of the cortex or medulla on which they depend.

I would submit to ophthalmic surgeons the importance of minutely investigating not only well-marked epileptic and epileptiform seizures, but also any slight transitory symptoms, with or without loss of consciousness, which patients with optic neuritis may have, especially when there are with them "subjective" sensations of smell or taste. These transitory and quasi-trifling symptoms may be slight epileptic paroxysms of a very important variety; their study when optic neuritis exists is important with regard to localization of changes productive of epileptic paroxysms of different kinds. In the vast majority of cases of epilepsy proper we discover no morbid changes

[9]Prin. and Prac. of Medicine, vol. i, p. 10; 2nd ed.

post mortem; when there is optic neuritis with epileptic seizures, we mostly find a very obvious change, often tumor of the brain; we can then infer the situation of the secondary changes in grey matter productive of epileptic fits of different varieties. It is quite certain that our present definite knowledge of epileptiform seizures in man comes from the study of those of these cases which are complicated by optic neuritis; and I have no doubt whatever it will be so in cases of epilepsy proper. By such work as I have indicated, we shall break up epilepsy proper into its varieties as we have done epileptiform seizures. No case of epilepsy, certainly no case of epileptiform seizure, is properly investigated unless the ophthalmoscope be used.

Dr. James Anderson has recorded[10] a case of tumor of the left temporo-sphenoidal lobe. In this case there was atrophy of both discs, but some weeks before death neuritis of one of them. There were also slight epileptic seizures, with "subjective" sensations of taste along with what is commonly called an "intellectual aura," but which I prefer to name "dreamy state." Such cases are of very great medical interest, and are of vastly more scientific value than scores of cases of epilepsy in which no organic disease of the brain is discovered *post mortem.* I have published a case of optic neuritis in which there were slight seizures with "subjective" sensations of smell along with the "dreamy state." [11] The patient died rapidly, as is so common in cases of optic neuritis, but no necropsy was obtained. In that number of *Brain* I have dealt with this variety of epilepsy (the one with the "dreamy state"), and refer briefly to a case under the care of Dr. Beevor and myself in which there were optic neuritis and hemiplegia, and also paroxysms with "subjective" smells and the "dreamy state." In this case also there was a tumor in the temporo-sphenoidal lobe. This case and Dr. James Anderson's patient's case are important, as bearing on and confirming Dr. Ferrier's cortical localisation of smell and taste. These are the only cases I

[10]Brain, October, 1886.

[11]Brain, July, 1888, p. 179.

know of, and one was uncompleted by necropsy, in which the variety of epilepsy I have spoken of has been found with optic neuritis. Such paroxysms being very slight, and not always attended by unconsciousness, might be easily ignored in cases of severe brain disease. I very much hope that ophthalmic surgeons will observe minutely, and with their customary precision, slight temporary "sensations," "queer feelings," etc., which patients with optic neuritis may complain of.

There is no end to speaking of the integration of ophthalmological and neurological knowledge. The ophthalmic surgeon studying nystagmus is helping toward the elucidation of the nature of tremor, in which the neurologist is greatly interested. Great attention should be paid, both by ophthalmic surgeons and physicians, to the tremor (Marie) in cases of Graves's disease—one of the four varieties of "vibratile tremor" of Charcot.[12] Work done on miners' nystagmus is valuable to the general body of scientific medical workers, as helping to complete the homologous series of professional spasms, of which writers' cramp is the commonest example. The work the ophthalmic surgeon has done on the symptomatology of cases of paralysis of ocular muscles gives the clue, as Wundt long ago suggested, to the interpretation of inco-ordinations experimentally produced by destructive lesions of nervous centres in animals. I think it gives the clue also to the interpretation of all disorders of co-ordination in man, including writers' cramp and other occupation spasms, from negative lesions. It explains the squinting resulting from hypermetropia; I think, too, that it explains the seeming alterations in the size of objects after instillation of atropine and eserine, a thing of importance, since these alterations occur at the onset of some epileptic fits.

In the field of the eye we are most likely to be able to trace the ascending complexity, speciality, etc., in the evolution of movements from the ocular muscles to their representation in most complex movements in the highest motor centres,

[12] Diseases of the Nervous System, vol. iii, Syd. Soc., p. 186.

that is, in the physical bases of visual ideas. Whilst a man is looking at anything, there is at that time engagement of all orders of centres from highest to lowest, and thence on to ocular muscles.

Much valuable material has been accumulated for the study of the evolution of ocular movements by Graefe, Hutchinson, Priestley Smith, Vulpian, Prevost, Ferrier, Horsley, Beevor, and others. We have clinical observations on ocular paralyses from disease of (1) nerve trunks, of paralyses from disease of (2) lowest motor ocular centres (ophthalmoplegia externa), of ocular paralyses (as in lateral deviations of the eyes), from lesions of (3) still higher centres ("motor region" of the cerebral cortex, or, as I call them, middle motor centres), and I hope we shall have such observations of ocular paralyses from lesions of (4) motor centres still higher—the highest motor centres, the physical basis of visual and of other mental states. I have considered this subject in the Bowman Lecture (1885).

There is no task I would rather accomplish than this, for by doing it we should do very much toward showing that the organ of mind is sensori-motor, as is the rest of the nervous system. We should thus place the study of epilepsy proper and insanity on a realistic basis. I have long urged a study of the evolution of movements, and first of all in ophthalmic journals. "If such an expression be permitted, there is a gradual increase in intelligence in movements from the lowest nerve trunks to the highest nervous centres." This, written in 1866,[13] expresses crudely what I think can be scientifically stated as a basis for investigation.

Alienist physicians, being more than any other physicians directly interested in the anatomy and physiology of the nervous system as they correspond to psychology, are of necessity interested in ophthalmology, and are in great debt to it. I hope they will be interested in the scheme of work suggested on evolution of ocular movements; but now I speak of some-

[13]Roy. Lond. Ophth. Hosp. Rep., vol. v, part 4, p. 290.

thing more definite. I do not see how any question can be more important or more fundamental in nervous physiology, as it expressly corresponds to psychology, than whether mental states do or do not occur with the "out-going" current, as well as with the "in-going" current.

Now the battlefield of this question is the case of paralyses of ocular muscles when the full symptomatolgy of those cases, particularly "erroneous projection," is considered. There are reasons more on the surface why alienist physicians should co-operate with ophthalmologists. Much has been done in the study of ocular symptoms of cases of insanity (Westphal, Allbutt, Wiglesworth), but much remains to be done in this direction. Great good would come from investigation of such an insanity as general paralysis by skilled ophthalmic surgeons conjointly with experienced alienist physicians and other neurologists. I very much wish this joint investigation could be made.

Physicians should try to help ophthalmology by bringing forward cases little likely to come under the notice of ophthalmic surgeons. Cases of spasmus nutans with nystagmus (a variety, I think, of spinal, or rather, spinal-system chorea, a symptomatic condition akin to canine chorea), would, as "living specimens," interest all our members. I wish surgeons who see cases of so-called traumatic tetanus would settle whether the muscles of the eyeballs do or do not suffer spasm in the exacerbations of this disease. If the ocular muscles are not involved their escape is a matter of great importance and significance, especially to neurologists. Physicians and ophthalmic surgeons ought to note the motor condition of the eyes in the tetanus-like seizures sometimes occurring in cases of tumor of the middle lobe of the cerebellum. Very much more could be done by physicians in the observation of the development and the order of development of ocular movements in cases of epileptiform seizures from mid-cortical disease. I hope that Horsley's promised demonstration before the Society of the representation of ocular movements in certain parts of the monkey's cortex cerebri will be a stimulus

to our medical members to note very carefully the behavior of the eyes in the "cortical fits" of man.

I think aural surgeons should bring before us cases of great ophthalmological interest. I have published the case of a man who had ocular movements during a paroxym of auditory vertigo,[14] and that of a woman[15] in whom lateral movements of the eyes were producible by pressure on a diseased ear. Mr. Laidlaw Purves gave me most important help in the investigation of the woman's case, as did also Mr. Couper. If such cases are met with by Mr. Purves, I hope he will let us see them, especially as he, having great ophthalmological knowledge, would investigate the ocular as well as the aural side of the cases thoroughly. Dr. Kipp, of Newark, New Jersey,[16] has recorded several very important cases of abnormal ocular movements in cases of ear disease. He refers to cases recorded by Bürkner, Urbantschitsch, Jacobson, Gruber and Moos, as well as to the two I have reported. I think all ophthalmic surgeons will be interested in Dr. Kipp's researches.

Speaking of otology, I admit that a knowledge of this department of medicine as well as of ophthalmology is of vast importance to the neurologist. I regret very much that I did not years ago pay as close an attention to otology as I did to ophthalmology, especially as the cases just referred to show that the two are related. Let young neurologists take warning so that they may not afterward have like regrets.

I have illustrated the relation of ophthalmology to general medicine by its bearing on neurology; it has, of course, much wider relations. I can best conclude this address by adopting the words with which Dr. James Anderson ends a paper:[17] "It seems to me the best and most hopeful feature of ophthal-

[14]Brain, April, 1879.

[15]Trans. Ophthal. Soc., vol. iii, 1883, p. 261.

[16]Trans. American Otological Society.

[17]"Some Ocular and Nervous Affections in Diabetes and Allied Conditions,' Ophth. Review, February to April, 1889.

mology that it has relations closer or more remote with every branch of medicine and surgery—indeed, with almost every branch of science."—*Brit. Med. Journ.*

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, OCTOBER 17, 1889.

J. HUGHLINGS JACKSON, M.D., F.R.S., President, in the chair.

The introductory address by the President will be found on page 911 of the *British Medical Journal.*

On the Pathology of Trachoma and the Relation of this Condition to the other Forms of Conjunctival Inflammation.—This paper by Dr. Thomas Reid, of Glasgow, was presented by Mr. Brailey. The author regarded the occurrence of groups of lymphoid cells at varying depths in the sub-epithelial layer as the essential part of trachoma. Those may be ill defined (lymph heaps) or more distinctly bounded (lymph follicles), though never possessing a perfectly defined limiting capsule. Their lymphoid elements are pervaded and supported by a very delicate stroma. Generally there is some infiltration of lymphoid cells around them which may even extend from one group to the next, and so on. Their origin is not a matter of absolute certainty, but the author is inclined with Michel to regard them as the dilated ends of the lymphatics of the conjunctiva. These lymphoid groups lead to changes in the epithelial layer, the deeper stratum of which may become vacuolated by œdema, so that the individual cells are often extended into a stellate form. Later, many of the cells may become distended and their nuclei pressed to one side, so that the characteristic appearance of goblet cells is presented. These may discharge their contents, leaving their walls standing and their nuclei attached to their floor, so that, after the throwing off of the condensed superficial epithelial layer, a

matter of not uncommon occurrence, the remains of the goblet cells constitute a series of irregular papilliform elevations characteristic of true forms of dry catarrh. Another important change, the development of mucous follicles, may take place in connection with the goblet cells. When the lymphoid groups, instead of being absorbed, have increased considerably in size, each one, with its covering of altered epithelium, or a small group of them, is apt to constitute a marked elevation of the conjunctiva, separated on each side from its neighbors by a deep depression. The layer of goblet cells occupying these depressions is frequently folded in so as to form a small pouch which may be much enlarged, so as to constitute a rounded mucous follicle which communicates by a short duct with the conjunctival surface. As above described, these mucous follicles are usually developed between the lymph follicles; but occasionally one and even several small mucous follicles can be seen occupying the centre of a single lymph follicle. Though usually flask-like, they are sometimes more tubular in form, presumably before the discharge of their individual cells, and the consequent accumulation of their contents. Though the lymph heaps or follicles may disappear by absorption, presumably by escape into the lymphatics, they perhaps more often discharge themselves externally by thinning and destruction of the overlying epithelium. There is always to be noted a tendency to softening and degeneration of their central part, as indicated by less definite structure and more feeble capacity for staining. Finally they may, instead of disappearing, become invaded by blood vessels, and gradually converted into a dense connective tissue, which situated in the ridge-like or papilliform elevations above alluded to, forms the grey gristly granulations characteristic of the advanced stages of severe trachoma. Careful examinations for bacilli have led to negative results, though the author is disposed to regard the implication of the cornea as a secondary infective process. In follicular conjunctivitis the author finds similar lymphoid groups and mucous follicles; also he has determined, by microscopical examinations, that the stage of grey gristly granulations

may be eventually reached; consequently, he regards the two affections as essentially one, though he recognizes that the vast majority of cases of so-called follicular conjunctivitis may be distinguished clinically from trachoma in that they do not tend to the development of the grey gristly cicatricial tissue. In some advanced cases of purulent ophthalmia he has found lymph follicles, and also in some cases of apparently simple long-standing conjunctival hyperæmia. The essence of purulent and catarrhal conjunctivitis, and also of conjunctival hyperæmia, appears to be a vascular congestion which may lead to a secondary lymphatic congestion, and the consequent formation of the lymph heaps and follicles, whereas trachoma and follicular conjunctivitis are from the outset essentially affections of the lymph follicles. This will account for the occurrence of mixed forms, as in Egyptian ophthalmia, and for the occasional occurrence of one-sided trachoma as a sequence to long-standing conjunctivitis of other forms. In conclusion, the author does not connect the lymph follicles or mucous glands with any of those glandular structures which are rarely found in the normal conjunctiva.—The paper was illustrated by microscopic preparations in the forms of photographs and magic lantern slides.

Keratitis from Paralysis of Fifth Nerve.—Notes of this case by Mr. W. E. Cant were read by the Secretary. The patient, a lad, æt. 16 years, attended at the British Ophthalmic Hospital, Jerusalem, on July 17, 1888, with complete paralysis of the left fifth nerve. The left eye showed some general injection, and the cornea were diffusely hazy. A history was obtained of an injury by a reaping hook two or three weeks previously, and a doctor who saw the lad two days after the blow had been inflicted found him in a semi-conscious state. There was a small penetrating wound of the squamous portion of the left temporal bone, about an inch above the insertion of the auricle; into this wound a probe could be passed to a depth of rather more than one inch. When seen again, on July 22, the left cornea was quite opaque, of a milky white color; there was much general congestion of the eye. He was admitted to the

hospital. During the next three weeks the condition of the left cornea became rather worse, and marginal ulceration occurred. The paralysis of the fifth nerve remained complete. The patient then left the hospital, and was not seen again for four months. When he returned the left cornea had partially recovered, but was still generally hazy. The function of the fifth nerve, both muscular and sensory branches, had been regained, but to only a limited degree. Mr. Cant thought the case had been one of direct injury to the whole fifth nerve within the skull, between the brain and the Gasserian ganglion, or at the latter.—*Brit. Med. Journ.*

ERRATA.

On page 269, on the first line from the top, read *past* instead of *next.*

On the same page, on the fourth line from the top, after *extirpate* insert *the.*

On page 270, on the sixth line from the bottom, insert between *before* and *infiltration* the following words: *closing the wound or extensive.*

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ON SOME RELATIONS BETWEEN THE DISEASES OF THE NOSE AND THE EYE.[1]

BY ADOLF BRONNER, M.D.,

Surgeon to the Bradford Eye and Ear Hospital.

In late years attention has frequently been drawn to the intimate relation between the diseases of the nose, and the diseases of the middle ear and throat; but we hear very little of the connection between the diseases of the nose and those of the eye.

The fact that the nose and eye are situated so very near together, that they are in direct connection with one another through the nasal duct, that the venous supply is in direct communication through the frontal veins, the lachrymal plexus, the ethmoidal veins and others, and that there is a very intimate reflex vasomotor connection, these facts are proof enough, that there must be a very intimate relation between the two organs. If we carefully go into the history of many cases of disease of the eye, we do in reality find that they are in close connection with some affection of the nose.

[1]Paper read before the British Larynogological and Rhinological Association, November, 1889.

In most cases of rhinitis, we find that the inflammation has spread up the nasal duct, thus causing the mucous membrane of the duct to swell, and preventing the free passage of tears into the nose; or, the inflammation has spread into the lachrymal sac, given rise to mucocele, and this causes and keeps up inflammation of the conjunctiva and cornea.

We all of us know how very difficult it is to cure some cases of epiphora, and how the affection returns again in spite of the most careful treatment by the ordinary methods; slitting open the canaliculus, passing tremendous probes, syringing out, etc. Now statistics prove that in about one-half of the cases of epiphora, the symptoms are caused by some stricture or affection in the canaliculi, or lachrymal sac. In about one-third of the cases there is no stricture, the lachrymal sac is not affected; the probe, if of any reasonable size, passes very readily, and we can find no cause for the epiphora, except a swelling of the mucous membrane of the nasal duct. The first class of cases are amenable to the usual methods of treatment, but in the latter, the epiphora returns again and again. And why? Simply because the seat of the disease is in the mucous membrane of the nose, and until we cure this, we cannot possibly prevent the inflammation from spreading up the nasal duct, and obstructing the free passage of the tears. I have, in late years, cured many cases of long standing epiphora, in which there was no stricture and no affection of the lachrymal sac simply by treating the mucous membrane of the nose.

Nearly all persons who suffer from chronic hypertrophic rhinitis are also subject to epiphora; the latter varies according to the swelling of the mucous membrane of the nose. When there is little swelling, or to put it more plainly, when the patient can breathe through the nose there is little or no epiphora. When the mucous membrane is swollen and the nostril is closed, the epiphora is well marked. These symptoms are very common indeed, at least in Yorkshire; but the ailment is so slight and varies so much, that in most cases the patients do not seek medical advice for the epiphora, and it is only when they come to you for the rhinitis that you see these cases. I have seen

very few cases of chronic rhinitis in which these symptoms were not well marked.

In most cases of mucocele or of abscess of the larchrymal sac, especially in cases of recurrent abscess, we find some affection of the corresponding side of the nares. Dr. Gruhn (*Centralblatt f. Augenheilkunde*, 1888, p. 438) found that out of 38 cases of mucocele the nose was affected in 36 cases. Faravelli de Kruch (*Annali di Ophthalmologia*, vi., 1887) reports that out of 35 cases the nose was affected in 30. I have at present, a young lady, from York, under treatment who is suffering from caries of the lower turbinated bones. She has had several abscesses of the left lachrymal sac which have been so carefully and well treated that the scars over the sac quite disfigure one side of the face. The nose had never been examined. Mucocele not only gives rise to epiphora, but in most cases, also to conjunctivitis, and often keratitis. In all cases of unilateral conjunctivitis we ought, therefore, to carefully examine the lachrymal sac and nares, just as in all cases of one-sided rhinitis or nasal polypi we ought always to examine the maxillary sinus.

There is a peculiar and typical affection of the conjunctiva and cornea, phylctænular or marginal keratitis, which is very common in children, and which has a great tendency to recur. If the eyes are once affected the disease is sure to recur several times a year for years. In these cases there is nearly always some affection of the nares. If we carefully treat and cure the rhinitis, the ophthalmia will probably not return again. I could relate many cases in hospital and private practice in which the ophthalmia recurred again and again, till the nose was also treated, and then the attacks ceased altogether.

In most cases of ozæna there is epiphora and conjunctivitis, and you often find ulcers of the cornea, which are very difficult to cure. Nieden (*Archiv f. Augenheilkunde*, xvi., p. 381) thinks that ozæna is partly due to the fact that the nasal duct is closed and that thus the tears cannot enter and moisten the mucous membrane of the nose. In all cases of hay-fever the conjunctiva is also affected.

Ziem (*Allgemeine Med. Central-Zeitung*, No. 23, 1886) draws

attention to the fact, that in most cases of granular lids there is also rhinitis. He thinks the rhinitis causes irritation of the conjunctiva, and that thus the conjunctiva is more liable to become affected by the trachoma bacilli, a statement which seems to me to be rather far-fetched.

I should like to say in a few words how very important it is, that, before performing any operation on the eye, we ought always to carefully examine the lachrymal passages and remove any obstruction or inflammation there may be there. At the Bradford Eye and Ear Hospital, before performing any operation which necessitates the opening of the eye, we always order the patient to use a sublimate eye lotion (1-5000) for some days before he enters the hospital. The day before the operation the lotion is applied frequently in the hospital.

There is another class of affections of the eye, to which I should particularly like to draw your attention. I refer to certain cases of muscular asthenopia, with norma l vision and accommodation, and also to cases of recurrent enlargement of the conjunctival vessels. I think, that I cannot better illustrate these affections than by recording in a few words two typical cases which have come under my notice:

Martin F., æt. 15 years, was brought to me in November, 1888, to get some glasses. For about a year he has not been able to read long together. After he has read for about fifteen minutes the eyes and forehead begin to ache and pain. He complains of severe frontal headache, worse in the morning. He has tried all kinds of glasses, had atropine applied for several weeks, without finding any relief whatever. If he does not use the eyes much, the pain decreases, but as soon as he tries to read the old pain returns as bad as ever. I found that the vision was perfect, very slight hypermetropia and slight weakness of accommodation. The fundus was congested. For about two years he has suffered from discharge from the nose, and has not been able to breathe through the nose for some time. I found hypertrophic rhinitis and post-nasal growths. I removed the growths, and applied the galvano-cautery in the nares. In six to seven weeks the headache and

pain in the eyes have disappeared, he can read as well as ever and for any length of time, and the symptoms have not returned since.

Mr. T., æt. 28 years, saw me in May, 1888. For some months he has noticed that after the slightest irritation—if he smokes, sits up late, drinks a little—the eyes became red, and remained so for a day or two. He looks, as he says, as if he had been on the "spree." There were no subjective symptoms of conjunctivitis; in fact, he complained only of the redness of the eye. I found several large and tortuous vessels in the conjunctiva bulbi, and slight pericorneal injection. The lids were slightly swollen; the fundus was decidedly congested; vision and accommodation were normal.

Various kinds of lotions, cocaine, hot fomentations, and abscission of some of the larger vessels, failed to prevent recurrence of the symptoms. I examined the nares, found well marked chronic hypertrophic rhinitis, and applied the galvanocautery. In three weeks the symptoms had disappeared, never to return again.

Gruening (*Medical Record*, January, 1886), Ziem (*Allgemeine Med. Central-Zeitung*, No. 20, 1886), Bettman (*Journal of American Medical Association*, May, 1887), and Maxwell (*Ophthalmic Review*, October, 1888), record similar cases.

Ziem (*Berliner Klinische Wochenschrift*, 37, 1888), Berger (*Archiv f. Augenheilkunde*, xvii., p. 293); Woakes ("Nasal Polypus") and others have proved that some cases of chronic hypertrophic rhinitis and also empyema of the maxillary sinus can give rise to scintillating scotomata, amblyopia, contracted field of vision and glaucoma. Ziem relates one very interesting case of bilateral empyema of the maxillary sinus, in which one eye was affected with glaucoma, and in the other there was distinct dimness of vision and contracted field. After the treatment of the empyema, the eye symptoms disappeared. Ziem thinks that in these cases the symptoms are caused by venous congestion, through direct communication of the nasal and ophthalmic veins and not by any reflex vasomotor action.

Woakes ("Nasal Polypus," p. 63), says: "Occasionally one

"meets with defective vision in conjunction with disease of the "ethmoidal bone, and in these cases, when submitted to oph-"thalmoscopic examination, hyperæmia of the fundus has been "noted. Thus it would seem that the circulation of the eyeball, "as well as of the lachrymal gland, is in correlation with the nasal "mucous membrane, responding by way of vessel dilatation to "irritation of the latter. Nor will this circumstance excite sur-"prise when it is remembered that the various branches of the "ophthalmic artery receive their vasomotor nerves from pro-"longations of the upper cervical ganglion, through which "ganglion the vessel reflexes already traced have been seen to "operate."

Similar symptoms, dimness of vision and contraction of field of vision, have also been observed after the application of the galvano-cautery to the mucous membrane of the nose.

Berger (*Archiv Augenheilkunde* xvii., p. 293) records one case, and Ziem (*Centralblatt f. Augenheilkunde*, August, 1887), has seen three eases.

Hack (*Erfahrungen auf dem Gebiet der Nasenkrankheiten*, p. 36), published two cases of orbital neuralgia, which were cured by the application of the galvano-cautery, in one case, to some granulation tissue on the middle turbinated bone, and in the other to the middle turbinated bone itself. Nieden also records a case in which severe infra-orbital neuralgia was caused by rhinitis. Empyema of the maxillary sinus is a very common cause of orbital neuralgia Some weeks ago I saw a case of severe supra-orbital neuralgia, which had been going on for years, and which was at once cured, after I had syringed out the maxillary sinus from the middle meatus.

Tumors from the nares, frontal or maxillary sinuses, or empyema of the sinuses, often give rise to exophthalmus. Nieden records two cases of malignant tumors growing from the nares, followed by bilateral exophthalmus and death. I saw a similar case only a fortnight ago. The peculiarity of these cases is, that they begin as apparently ordinary nasal polypi, which bleed very readily, and which suddenly develop into rapidly spreading malignant tumors.

Hartmann (*Berliner Klinische Wochenschrift*, p. 325, 1884), records a case of orbital abscess following acute rhinitis. F. Konig (*Inaugural Dissertation, Bonn*, 1882) has collected forty-three cases of hydrops and empyema of the frontal sinus, which affected the orbit. Peltesohn (*Centralblatt f. Augenheilkunde*, p. 35, 1888), records three cases of empyema of the frontal sinus, which burst into the orbit. Nieden also reports a similar case.

These few facts prove that, in some cases at least, there is a close connection between the diseases of the nose and of the eye. They prove that, in these days of rapidly growing specialism, we should be careful not to forget that one organ, although it may have its special functions and special diseases, is still only a part of a part or of the whole, and that we ought always carefully to examine and see if the one disease be not in some connection with some affection of a neighboring organ, or with some constitutional disease.

EXPERIENCES WITH A CASE OF CHRONIC MIXED CLONIC AND TONIC BLEPHAROSPASMUS.

BY ADOLF ALT, M.D.

Cases of chronic clonic blepharospasmus are not so frequent that experiences in the treatment of such a case, as I shall relate later on, should not be of interest to our readers.

Before, however, recording this case, it may not be without value to collect in short words what some of the text-books which just happen to be on my desk, have to say about this affection.

Michel[1] says: In a large majority of the cases in which there is no known cause for the existence of the blepharospasmus, "pressure-points" may be found; when pressure is exerted on these points the spasms appear relieved, or even cease, or the patients have a sensation of increased sensibility, or even pain. These points are mostly where the supraorbital and infraorbital nerves leave the bone near the upper and lower orbital margin. In these cases the lid spasms are often but a part of a general facial spasm. * * *

* * * In the treatment we must consider the general condition of the patient and the possible causes; in neurasthenic and anæmic conditions, tonic treatment is necessary; inflammations of the eye, the conjunctiva, the cornea and the uveal tract must be treated. * * * In cases in which "pressure points" are found, the methods generally in use in the treatment of neuralgias must be applied, as the constant current, and in desperate cases, neurectomy.

Meyer[2] says: * * * By the term of blepharospasmus is

[2]Practical Treatise on Diseases of the Eye. Translated by F. Fergus, M.D., Philadelphia, 1887, p.

[1]Lehrbuch der Augenheilkunde. Wiesbaden, 1884, p 179.

generally meant the spasmodic occlusion of the palpebral fissure, whether it take place only intermittently, or last for some length of time.

This form of blepharospasmus may be due to various causes. * * * Often the blepharospasm is at first only intermittent, but becomes continuous and extends to the neighboring muscles, and even to those at some distance. This chiefly occurs in cases of general neurosis. In these cases, also, it has been observed that in the region supplied by the fifth pair there is a point where, if the nerve be compressed against the bone, the blepharospasm is made to cease. * * *

* * * If the blepharospasm remain even after the inflammatory concomitants have disappeared, or if it be determined by a neurosis of the fifth pair, we must ascertain whether compression in the course of one or the other of the branches of that nerve does not modify the spasmodic contractions, or does not cause them to cease altogether. The nerve which chiefly supplies the orbicularis with sensory fibres, is the supraorbital, and we, therefore, should begin our attempts at compression with it; but experience has shown that we should not stop with it, but also try the effect of compression on the infraorbital, the temporal branch of the molar, and the inferior dental.

When we have thus determined the point at which compression seems to act favorably on the contractions, we generally try the effect of subcutaneous injections of morphia at that situation. Nor should it be forgotten that the result often depends on the solution being injected exactly at that spot and in the centrifugal direction of the nerve. * * *

* * * Sometimes morphia injections, if repeated often enough, succeed in curing the disease; in other cases, however, they only procure a transitory amelioration. * * * It is in such cases that we are authorized to have recourse to a neurotomy or neurectomy. * * * If we have not been able to find a point at which compression of the nerve causes the blepharospasmus to cease, or if our neurotomy has not been followed with success, we must try the constant current.

Macnamara[3] says, after having spoken of nervous winking: * * * A far more serious form of blepharospasm is that in which the contractions are of a tonic kind, and either intermittent or continuous. Even when intermittent the disease is often most distressing, and attended with absolute danger to the patient, for he may be seized with a spasm of the lids at any moment, thus destroying his sight for the time; and supposing that he happens to be crossing a crowded street at this particular moment, he runs the risk of being thrown down and run over. Moreover, the affection is in other respects a most painful one, interfering, as it does, with work, and rendering the patient unfit for all useful employment. * * *

* * * The third class includes cases of neuralgic tic of the face, in which the morbid condition of the fifth nerve, especially its supraorbital branch, is propagated by reflex action to the seventh pair, causing spasm of the orbicularis. Malaria, rheumatism, sudden exposure to cold, irritation of the nerve by bony growths in its passage through the skull, or faulty digestion, may be mentioned as some of the most common causes of this form of blepharospasmus. * * *

* * * But in the third class of cases we should try to ascertain which of the branches of the fifth nerve is principally involved, and, as a guide to its discovery, we may exert pressure at different points of the surface—for example, over the exit of the supraorbital nerve—and notice if it influences the spasm of the lid; or, again, we may examine, in the same way, the inferior dental nerve at the dental foramen. If we can thus discover the point of departure of the irritation among the branches of the fifth, we may very probably, by division of the nerve, interrupt the chain of nervous actions on which the spasm of the orbicularis depends. It may be necessary to divide the nerves on both sides of the face; and at first the beneficial effect of the operation may not be very apparent, but gradually the spasm passes off, to the great relief of the patient. Unfortunately, after an apparent cure has been effected in this way, the disease will sometimes return.

[3] A Manual of the Diseases of the Eye. Philadelphia, 1882, p. 96.

Among other remedies which may be usefully employed for the relief of blepharospasmus, are electricity, the continuous current being used, and also subcutaneous injection of morphia. These should always be tried before we have recourse to surgical interference. * * *

Strange to say, I cannot find anything about the disease under consideration in the text-books by Nettleship, Higgins and Mittendorf. Nor it it necessary to consult any further text-books. The extracts given above agree in the essential points with each other.

Luckily, quite a number of these cases yield readily to the least heroic treatment, that is, morphine injections and the constant current. Yet, whether the cure is as often a permanent one, as we may think, I venture to doubt.

The following case is the most desperate one it has been my luck to have to attend to. With what effect I shall now relate.

On September 29, 1889. E. B., æt. 56 years, a small, poorly nourished individual, was led into my office for the first time to consult me on account of the inability "to keep his eyes open." The history that he gave, was, that about fourteen years previously, his eyes had begun to wink, the left one more than the right. The trouble grew gradually worse, in spite of treatments of all kinds. He had had morphine injections made and the constant current applied for months daily, had had glasses prescribed and his eyelids cauterized. He has been treated with all sorts of tonics, by starvation, and by all sorts of other therapeutic measures. He had gone from Pontius to Pilatus, but all to no avail. A prosperous business man when the trouble began, he had got rid of all his worldly possessions, and was deeply in debt to sympathizing friends. He could not venture on the street alone, and had had many hair-breadth escapes. He now came to me to try once more whether it was not possible to give him at least that much help, that he might be able to work a few hours a day at his trade, fine basket and cane work, and thus earn at least a living. He was ready to jump into

the river and end his miserable life, if nothing could be done for him.

While thus talking to me, the patient sat before me, a miserable sight, his lids most of the time closed tightly, while at intervals of several minutes a few clonic spasms would change the aspect, and allow him to get a momentary dim view of the surroundings. He could not keep one eye, nor even part of one, open for half a minute, in fact, he had not the slightest control over his eyelids. Pressure on the notch of the supraorbital margin where the supraorbital nerve emerges from the orbit, caused some pain, but the spasm seemed for a short time lessened, while pressure on both the supraorbital and the infraorbital nerves did so to a more marked degree.

After the instillation of a few drops of a 4% solution of cocaine the spasm was also relieved to a certain degree, sufficiently so, to enable me to examine the cornea and the conjunctival sac,and to make sure that there was nothing pathological in these membranes to account for reflex-spasms. The patient felt, however, so gratified when the cocaine had reached its full effect, that he begged me to see whether the repeated use of these drops would not allow him to do some work. I accordingly gave him a prescription for a cocaine solution, but, as I had expected, he returned the next day with the statement, that the effect, as pleasant as it was at first, was not lasting enough to be of value to him, and he even thought that he was worse after this effect had passed off.

I now advised neurectomy, but when it came to operating, he begged of me to try everything else first. Accordingly, I first stretched both orbicularis muscles forcibly by means of a spring-speculum. This manipulation acted for a short time quite well, but the effect did not last much longer than that of cocaine. As he was, however, not yet ready to have neurectomy performed, I next made myotomy at the outer canthus of each eye, guarding him against allowing the wounds to heal rapidly. This little operation had such a beneficial effect on the spasms of the lids, that he remained away from my office for almost two weeks, and did some work at his trade.

After that period he returned, not quite as bad as before, but still unable to keep his eyes open longer than a few minutes at a time. He was now ready to submit to the neurectomy at least of the supraorbital nerve of the left eye.

This operation I performed on December 4, with the kind assistance of Drs. Riesmeyer and Richter. After having made an incision through skin, muscle and tarso-orbital fascia along the upper orbital margin, the contents of the orbits were depressed, and the supraorbital nerve was cut as far back in the orbit as possible, and then at the incisura supraorbitalis. In this way a piece of nerve, nearly an inch long, was removed. The wound was closed by five sutures and healed *per primam.* The left forehead had, of course, lost all sensation.

When the bandage was removed the spasms were very considerably reduced in number and strength, and he felt greatly relieved, so that he was in no way ready to take my advice and have the right supraorbital nerve resected also.

Gradually, however, it became apparent that, although the spasms in the upper lid were almost totally wanting, every few minutes the lower left lid would be pulled up and remained fixed for a few seconds in such a position that sight was as much impaired as before. Still, he managed to do some work and would not submit to a further operation, as long as he was able to do this.

On December 21, finally, he was convinced that something more was necessary to allow him to keep on working. Accordingly on that day, with the assistance of the same gentlemen, I performed neurectomy of the supraorbital nerve on the right side, in the same manner in which I had done the same on the left side. Then I resected both infraorbital nerves.

In order to find this nerve, a T-shaped incision was made, the vertical incision in a line from the inner margin of the cornea to the interstices between the first and second molar tooth, beginning at the infraorbital margin and going through skin and muscle down to the *pes anserinus* in the *fossa canina.* The horizontal incision was made along the infraorbital margin. I was prepared to chisel open the infraorbital canal, but on

grasping the nerve and pulling it cautiously forward I found that I could easily resect a piece, about three-quarters of an inch in length, which I accordingly did.

The healing after these operations took place rapidly and without disturbance. The result was very gratifying to the patient, but not to me—that is, the spasms were very weak at first, and did only come on at long intervals. He was able to work in proper light for two hours at a time, but it was at once evident that the facial spasms, which, before the operations had seemed of no importance, grew worse now. When I saw him last, he was still very grateful for what I had done for him, and was able to make a living by his work; but I could not understand why he should feel so grateful, since the facial spasms closes his eyes almost as effectually as the lid spasms had done, but perhaps at longer intervals. Of course, the patient and the surgeon do not judge from the same standpoint.

SELECTION.

NOTES OF A LECTURE ON SOME FORMS OF RETINAL PIGMENTATION.

BY W. ADAMS FROST, F.R.C.S.

Delivered at the Royal Westminster Ophthalmic Hospital.

I do not propose here to deal at all exhaustively with the subject of pigmentation of the retina, but merely to illustrate some forms in which it occurs, which appear to me to be in some degree typical of their kind. It is, I believe, generally admitted that in all cases in which pigment is found in the anterior layers of the retina, its source is the layer of hexagonal pigmented cells which is now considered to form the deepest layer of that membrane. The most common cause of pigmentation of the retina is undoubtedly choroiditis, and although it must be considered an established fact that the pigment layer is histologically a part of the retina, yet clinically it is much more intimately associated with the choroid, participating as it does, very readily in affections of this membrane, and often escaping in affections of the retina—not even accompanying it when it becomes detached from the choroid.

It is a curious feature about pathological pigmentation of the anterior layers of the retina that it is always associated, sooner or later, with de-pigmentation of the layer that normally contains pigment; to what extent these two processes are correlated as cause and effect I will not now consider.

I propose to consider some cases of retinal pigmentation which have at any rate this in common, that they are secondary to choroiditis. Examples of these are given in the accompanying lithographic plates.

Fig. 1 is an illustration of one form in which pigmentation of the retina may occur as a physiological peculiarity. The pigment is arranged in groups, each being formed by an aggregation of small black dots varying from 2 to 6 in number. These groups are scattered over a wedge-shaped area, having its apex at its optic disc, and its sides formed by the inferior nasal and inferior temporal vessels. The painting was made from a child who had normal vision, the visual field was not taken. I have seen another very similar case[1] in which the individual groups were larger but fewer in number; in this case the fundus-red was rather darker than usual. The subject was a boy, æt. 13 years. There was total hypermetropia of 2.75 D.; the vision was normal. A case very similar to these is figured in Wecker and Jaeger's *Atlas* (Fig. 76.) under the title "New-Formation of Pigment." In this also, vision was normal.

There can be no doubt that these are examples simply of a physiological peculiarity analogous to that which occasionally causes one sector of the iris to present a pigmentation which is in contrast with the remainder.

For the opportunity of obtaining drawings of this and many other physiological pecularities of the fundus I am indebted to Mr. S. Stephenson, at the time that he was assistant medical officer of the South Lambeth schools.

Fig. 2 and 3 are examples of retinitis pigmentosa in an early and late stage respectively. The name of this disease is in such general use that it would be idle to attempt to change it, yet in many respects it is misleading; for in the first place the disease is much more of a degenerative than of an inflammatory type; in the second place, pigmentation of the retina occurs in other conditions; and in the third, in many cases which must certainly be included under the titie, retinal pigment is present in quite an insignificant amount (as in Fig. 3). The name, however, is comparatively unimportant as long as it is by general consent taken to refer to a definite clinical entity, of which the

[1] These and other allied conditions were illustrated by lantern slides projected on a screen.

objective symptoms are night-blindness and a gradual diminution of the visual field with retention of fair central vision, the whole running an eminently chronic course, extending over many years. At the same time there are the characteristic objective signs to be seen with the ophthalmoscope, namely, pigmentation, of the superficial layers of the retina, which allows the choroidal vessels to become visible.

Now, the term "retinitis pigmentosa" tends to exalt the value of the one factor in the disease at the expense of the other. Even some of our best tex-books are free from ambiguity as to the value that is to be attributed to atrophy of the pigment layers as a symptom in this disease. Thus, in Dr. Berry's *Diseases of the Eye*, page 162, we find that, "typical cases of retinitis pigmentosa are quite different from the variety following severe syphilitic choroiditis, and are easily recognized by the delicate shapes of the pigment deposited in the retina, its relation to the vessels, and the absence often of any disappearance of the pigment in the hexagonal cells;" but, on page 275, we find that in true retinitis pigmentosa "there is usually a conspicuous defect in the pigment or the hexagonal cells, which allows the choroidal vessels with their pigmented interspaces to come into view."

I do not think sufficient stress has been laid by writers upon the fact that, as the disease progresses, the affected area becomes more extensive, but no proportionate increase takes place in the amount of pigment in the area of the fundus first affected. My own expression is—although I should like to see more cases before forming a positive opinion on the point—that the pigmentation diminishes in the later stages of the disease, and from the cases I have seen I should consider that Figs. 2 and 3 may be taken as fairly typical examples of the early and late stages of the disease.

Fig. 2 is a painting from the left eye of a girl, A. M., æt. 23 years. She is the third of 5 children, the others being stated to be free from any affection of the eyes. One brother and one sister were seen by me, and their eyes were normal in all respects. The parents are both living, and stated to be in good

health; they are are not blood relations. The patient herself is anæmic, but otherwise in good health. There are no signs of inherited syphilis, and no history or likelihood of the disease having been acquired.

In January, 1887, the patient first noticed that the sight of the left eye was not as good as it had hitherto been; she did not notice that the defect was greater at night. An attack of conjunctivitis appears to have directed her attention to the eye. Since then the patient thinks that the sight has gradually deteriorated; but this seems to be due rather to continued contraction of the visual field than to any actual lowering of the visual acuity.

She was first seen by me in February, 1888, at St. George's Hospital. The vision was then, in both eyes, $^{6}/_{\text{XII}}$, improved by 0.50 D. to $^{6}/_{\text{IX}}$. The visual field in the right eye was practically normal; in the left it was at first thought to be contracted concentrically to about 20°, except below. A subsequent examination showed this to be a mistake, and that beyond this central field, and separated from it, except below, by a blind area, was a peripheral band of functionally active retina; in fact, the condition was analogous to the ring scotomata occasionally seen in this disease, but the ring was incomplete below, while above its breadth caused it to reach beyond the confines of the normal field. The light-sense was found to be very defective. With Foster's photometer, but with a different illumination and test object than used by him, the right eye required an aperture having a diameter 14 mm., and the left 20 mm., while the average of 10 normal eyes gave 3 mm. as the minimum aperture required. With the ophthalmoscope the right eye showed a few streaks of pigment at the extreme periphery; the disc and vessels were normal. In the left eye the appearances were those depicted (Fig. 1). It will be seen that there is a considerable amount of pigment in the peripheral parts of the retina, and that this is made up of fine dots, which, by giving off processes that anastomose with others, form a network over the affected portion. It will also be seen that the pigment layer of the retina is atrophied in places, so that the choroidal

vessels are visible, but the pigmentation is a more prominent feature of this case than the atrophy of the pigment layer. The retinal vessels are somewhat diminished in size, and the disc has a peculiar dull dirty hue. The drawing was not made till July, 1888, but no appreciable change had taken place in the appearances since the patient was first seen.

The vision during the whole time has fluctuated somewhat, without any obvious cause. At the last visit, on April 4, 1889, it was still $^6/_{\text{IX}}$, but on October 3, 1888, at the hospital, it was noted a being $^6/_{\text{XVIII}}$, and the next day it was only $^6/_{\text{XXXVI}}$, when tested at my house; the illumination on the latter occasion was certainly not worse than on the former. The visual field has been tested several times, but no appreciable variation has been found.

Fig. 3 illustrates a much later stage of retinitis pigmentosa. It is from the left eye of J. D., æt. 35 years. When I first saw him on August 19, 1885, vision had been failing very gradually for ten years; the defect was at first only noticed at night, and it has always been much worse then. In 1879 he attended the Royal London Ophthalmic Hospital for iritis; it does not appear that the fundus was examined at that time; and unless the patient had mentioned that he suffered from night-blindness, the ophthalmoscope, of course, would not have been used. The attack was evidently a very slight and transient one. It is interesting to note that the vision was then tested and noted as being $^{20}/_{\text{LXX}}$, improved by —2 D. to $^{20}/_{\text{XX}}$ (that is, approximately, $^6/_{\text{XXIV}}$ and $^6/_{\text{VI}}$).

When first seen by me the vision of each eye with —2 D was $^6/_{\text{IX}}$; since then it has very slowly got worse, with slight fluctuations; and on November 16, 1889, it was $^6/_{\text{XVIII}}$. The patient has for several years taken iron, sometimes leaving it off for a few months; he is an intelligent man, and holds a very strong opinion that his vision is better while taking the iron. I have not been able, however, to satisfy myself of the accuracy of this belief.

The visual fields have also undergone a slow but steady contraction while the patient has been under observation. In

1885 that of the right eye had a radius of 20° upwards, and 22° downwards, 25° outwards, and 10° inwards. The left eye 18° upwards, 35° downwards, and 20° to each aside. On November 16, 1889, the right field measured had a radius of 10° in all directions, while the left was the same, except that it was prolonged outwards to 20°.

The ophthalmoscopic appearances have not appreciably altered since he first attended; in several respects they differ considerably from those seen in the preceding case. The pigment is comparatively scanty, but its arrangement is characteristic; it is most abundant at the periphery, but it approaches nearer to the centre than in the preceding case. It consists of dots and lines, from which fine processes are given off; these, in places, anastomosing with other processes, form an irregular network; the pigment evidently lies quite in the superficial layers, and in one place follows a retinal vein as if lying within its sheath. The atrophy of the pigment layer, on the other hand, is more extensive, and reaches right up to the optic disc. The latter also shows atrophic changes, and the retinal vessels are diminished in size.

Fig. 4 differs at first sight greatly from the preceding cases. The most striking feature about it is the enormous number of choroidal vessels that are visible, owing to the atrophy of the pigment layer of the retina. The atrophic process has also tended to the capillary layer of the choroid, with the result that, except in a few places where this layer remains intact, the normal red groundwork has given place to a dirty brown. The choroidal vessels also near the disc appear to have undergone morbid changes which have rendered their walls white and opaque. There is but little pigment, but what there is is arranged much as that in typical retinitis pigmentosa.

The drawing was made from the right eye of E. S., æt. 55 years, at present a workhouse inmate. At the age of 21 he enlisted; he served in India for about twelve years, and left the army in 1871. A year later his sight began to fail; at first the defect was only noticed at dusk, but there has since been a gradual deterioration of vision, although the defect has

always been much greater at night. Notwithstanding the extensive changes in the fundus at the time the painting was made, central vision with this eye was three letters of $^6/_{XII}$ in ordinary daylight; at night-time he was as helpless as a blind man. The visual field was contracted to about 20° in all directions, conditions which correspond with the freedom of the region of the yellow spot from disease. In the left eye the changes were very similar, but a little more advanced, vision being reduced to hand-reflex.

A case that is almost identical with this has been recorded, and figured by Mr. Standford Morton in the Transactions of the Ophthalmological Society, vol. v. In this case the central vision was normal at the time the drawing was made, but the visual field was much contracted. When I saw the patient fifteen months later, the vision was $^6/_{XVIII}$, but it probably varied.

It seems to me that these cases are strictly analogous to true retinitis pigmentosa, or, at any rate, that it would be well to place them in this category till we obtain fuller knowledge. The clinical symptoms are identical, and the difference is chiefly in the greater prominence of the atrophic changes and the comparative insignificance of the pigmentation, but these are differences in degree and not in kind, and are possibly to be accounted for by the late appearance of the disease. I should provisionally look upon these cases as examples of senile retinitis pigmentosa, of course using the term "senile" merely in a relative sense.

NINTH MEETING OF THE OPHTHALMOLOGICAL SOCIETY, HEIDELBERG, SEPTEMBER, 13 to 15, 1889.

(*Hirschberg's Centralblatt*).

The Graefe-prize for the best paper published in *Graefe's Archives*, during 1884 to 1886, was given to Professor Deutschmann, at Hamburg, for his article: *On the Pathogenesis of Sympathetic Ophthalmia* (*Ophthalmia Migratoria*) (Vol. XXX). At the same time Dr. W. Uhthoff's article: *Studies Concerning the Influence of Chronic Alcoholism on the Human Organ of Vision* (Vol. XXXII) was honorably mentioned.

1. Mr. Kniess (Freiburg): *On Disturbances in Color-Perception Accompanying Atrophy of the Optic Nerves.* Kniess observed three cases of atrophy of the optic nerves with disturbance of the perception of colors. In the first case, visual acuity was normal, the visual field was contracted up and outward. With the worsted color-test, partial green-blindness was found. In the second case, the visual acuity was one-third, the visual field was concentrically reduced, and yellow was not distinguished from orange. In the third case, there was a central scotoma for green, which disappeared in intense light. Kniess thinks, that the seat of color-perception is not in the retina, but in the cortex of the brain.

Mr. Meyer (of Paris) asks whether in these cases there was not a diminution of the light-sense.

Mr. Foerster (Breslau) states, that the light-sense is not affected in cases of atrophy of the optic nerve.

2. Mr. Uhthoff (Berlin): *On Anomalies in the Motility of the Eyes in Multiple Sclerosis.* Uhthoff examined 100 cases of multiple sclerosis, and found paralyses of ocular muscles in 17% of

them; there was six times paralysis of the abducens, three times of the oculomotorius, three times of associated movements, three times of the internal rectus, and twice ophthalmoplegia externa. These paralyses are of central origin and appear in the later stages of the disease. They often affect both sides. Paralyses of the ocular muscles are much more frequent in dorsal tabes; he found paralysis of the oculomotorius in 26%, and paralysis of the abducens in 12%. Complete ophthalmoplegia interna accompanies tabes; contrary to what is found in sclerosis, the ophthalmoplegia externa is but rarely seen. Nystagmus is often found in sclerosis, about in 12%, and nystagmus-like contractions in 46%. Nystagmus is, therefore, of great pathognomic value for the diagnosis of disseminate sclerosis. The paralyses differ from tabetic ones, by being accompanied by the nystagmus-like contractions, while the latter are combined with reflex-immobility of the iris. In cases of sclerosis the pupil shows little that is abnormal; Uhthoff saw only one case of reflex-immobility of the iris, and but three times a difference in the size of the pupils.

3. Mr. Fischer (Dortmund): *On Keratitis with the Formation of Thread-like Excrescences on the Cornea.* Fischer differentiates three different kinds of this keratitis. In one of them small vesicles are formed on the surface of the cornea, in the second diffuse opacities are observed, and in the third small threads are seen to protrude from opaque points in the cornea. Fischer believes, that these are formed by coagulated fibrine coming from the cornea, and that in character they are similar to Curschmann's spirillæ from the bronchi.

Mr. Leber, also, considers these threads to be coagulated fibrine, but he believes, that their origin is in the conjunctival secretion.

Mr. Uhthoff defended the opinion of Mr. Fischer.

4. M. St. Valude (Paris): *On a New Designation of Prisms.* Valude proposes to designate prisms by their angle of deflection.

5. Mr. C. Hess (Prage): *On the Color-Sense in Indirect Vision.* Hess states that in normal vision the fields for red

and green are differing but slighty, and that this difference is due to the fact, that the tests which appear as equally light tints of green and red, are not equal in reality when compared with white. When they are rendered equivalent the differences of the fields disappear. Hering has constructed an apparatus by which his statements are easily proven.

6. Mr. Wagenmann (Gœttingen): *On Purulent Infiltration of the Vitreous Body, Taking Its Origin from Scars of Former Operations and from Anterior Synechiæ.* Wagenmann examined 18 eyes, in which an operation and subsequent anterior synechia were followed by purulent infiltration of the vitreous body. He found in every case an infection starting from the scar. Cystoid scars are especially favorable to such an infection. The time varies considerably; months, years, or even decades may intervene. As such a scar becomes gradually more elastic, the wall gets thinner, and, in consequence, there is a better chance for an infectious material to penetrate to the interior of the eye. It was always possible by anatomical examination to trace the pus, or rather the cocci, from their entrance at the scar to the interior of the vitreous body. In one case the presence of the staphylococcus was proven by inoculation; in all other cases by anatomical means only. The blood-vessels never contained any cocci.

Mr. Meyer believes that the infection may just as well be endogenous. In this case the scar would have to be considered simply as a *locus minoris resistentiæ.*

Mr. Leber does not believe in endogenous infection, since the cocci are found in the scar and in the vitreous body only, while the blood-vessels never contain them.

Mr. Schmidt–Rimpler agrees with Mr. Meyer, and states that the formation of pus is very frequently preceded by a disturbance in the general system.

7. Mr. E. Fick: *On the Recuperation of the Retina.* It is a well-known fact that the retina tires easily. Therefore, certain conditions must be in existence, which regulate this tiring. Fick considers the movements of the eyeballs, the movements of the eyelids, and the play of the muscles of accommodation

to be such regulators. By these movements the intraocular pressure is increased. Even if this increase be but slight, the circulation of the blood in the retinal blood-vessels is thereby furthered.

Mr. Becker draws attention to the fact that changes in the intraocular pressure involve especially and, at first, the choriocapillary blood-vessels and the pigmented epithelial cells, and in this manner the production of the visual substance [purple? Translator] is influenced.

Mr. Snellen thinks that seeing nebulæ is not due to any trouble in the retina, but is caused by the tear-fluid and particles of dust on the cornea. The beneficial influence of the movements of the lids and the eyeballs would thus be easily explained.

Mr. Leber agrees with this view, and thinks that we must, moreover, not lose sight of the change in the site of the images upon the retina.

8. Mr. Weiss (Heidelberg): *Contributions to the Anatomy of the Retina.* Weiss relates the results of the measurements of the orbits of several hundred skulls.

Second Meeting, September 14.

1. Mr. Wicherkiewicz shows a new model of his shells for covering eyes when treatment by darkness is required.

2. Mr. Schoen (Leipzig): *On a New Symptom of Traction in the Myopic Eye.* Schoen outlines in a few words the anatomical changes in the ciliary muscle and Schlemm's canal in the myopic eye. If a tangent be drawn through the ciliary body of a myopic eye which has been cut in two in a horizontal direction, Schlemm's canal on the temporal side lies behind the tangent, and on the nasal side in front of it. This explains why the internal rectus muscle during convergence does not only pull on its insertion, but also on the neighboring sclerotic and cornea, and thus actually pulls the outer membrane over the inner membranes, especially over the region of the ciliary body.

Messrs. Kniess and Stilling speak against this theory.

Mr. Mayweg (Hagen): *On Recurring Hæmorrhages into the Vitreous Body.* A young man had lost one eye totally by hæmorrhages into the vitreous body when Mayweg observed a hæmorrhage taking place in the fellow-eye, so that vision was reduced to the seeing of the movements of the hand. In order to prevent total blindness, he ligated the carotid artery. No further hæmorrhage then took place. A year later V.= $^{20}/_{XL}$.

Mr. Nieden speaks against such heroic remedies and recommends internal treatment, which, he thinks, will hardly ever fail.

Mr. Snellen is against any and all operative procedures in cases of philæmia.

4. Mr. Menacho (Barcelona): *On Jequirity in the Treatment of Diseases of the Conjunctiva and Cornea.* Menacho uses jequirity in all forms of pannus, even when there is no trachoma, and in sclerosis of the cornea. He uses it as a powder, which he dusts on the everted lids and which he allows to act there for from 2 to 5 minutes. He has never observed any complications.

Mr. Sattler thinks the use of jequirity is indicated in certain forms of trachoma only, while Pagenstecher and Gunning speak of it as a very unreliable remedy.

5. Mr. Menacho read a further paper: *On Subconjunctival Sclerotomy.*

6. Mr. Kamoki (Warschau): *On Hyaline Degeneration of the Conjunctiva.* The author describes the results of a series of anatomical examinations of hyaline degeneration of the conjunctiva.

7. Mr. Schweigger (Berlin): *On the Objective Diagnosis of the Refraction.* Schweigger extols the advantages of the objective diagnosis of the refraction by means of the shadows, and demonstrates an ophthalmoscope he has modified for this method of examination.

Meeting for Demonstrations Sept. 14, 3 p.m..

1. Mr. Kuhnt (Jena) demonstrates two illustrations for teaching: 1. A frontal section through the head. 2. Schematic arrangement of the finer structure of the retina.

2. Mr. Ferrer (San Francisco) shows the modified opthalmometer of Javal.

3. Mr. Schœn (Leipzig) shows microphotographic illustrations of beginning cataract.

4. Mr. Sattler (Prag) demonstrates pure cultures of cocci from the conjunctival sac. By means of a new method recommended by Kroll at Prag, these cultures were rendered permanent.

5. Mr. St. Valude (Paris) shows specimens of an eye with a rare form of staphyloma of the cornea.

6. Mr. Bernheimer (Heidelberg), specimens of a typical lymph-adenoma of the orbit.

7. Mr. Dinkler (Heidelberg), microscopical specimens of miliary tuberculosis of the choroid.

8. Mr. Whiting shows frontal and sagittal sections through heads of human embryos.

Third Meeting, September 15.

1. Mr. Becker (Heidelberg): *Contributions to the Anatomy of Detachment of the Retina.* Becker distinguishes between three forms of detachment of the retina: 1, when the whole of the retina and the pigment epithelium are detached; 2, when the pigment-epithelium remains *in situ*; and 3, when both conditions obtain. According to Kuehne the function of the retina returns, as soon as the cones come once more in contact with the pigment-epithelium, as proven by experiments on frogs. Might this not also be the case when a retina has been but recently detached in man? In old cases the rods and cones are degenerated. In practice the cases are mostly of this kind.

Mr. Leber thinks that in recent cases the rods and cones are usually not much degenerated; yet, the function of the de-

tached parts is, as a rule, destroyed, even if they become reattached. Of course, the locality of the detachment is of great importance.

Mr. Schweigger believes that by ophthalmoscopic examination we find but very rarely any pigment epithelium attached to the detached retina. In speaking of the treatment he relates that he has tried the method of Schöler, namely, the injection of tincture of iodine, in eight cases. The results were *nil*, or even directly bad. In the best cases the eyes stood the injection of iodine well. He is forced to warn the colleagues against the employment of this remedy. He doubts that there was really a detachment of the retina in the case reported by Schöler.

Mr. Uhthoff does not consider this method as without any value; at least from what he has seen in Schöler's cases. He is of the opinion that this method is worthy of employment and trial.

2. Mr. Dimmer (Vienna): *On the Treatment of Total Scars of the Cornea with Anterior Synechiæ.* Dimmer has made a series of experiments on rabbits to implant an artificial transparent cornea in cases of leucoma of the cornea with anterior synechiæ. To this end he used small transparent shells of celluloidine which he implanted into small openings cut out with a trephine. After having been successful in a series of cases on rabbits, he operated in the same way on patients. In two cases the shells remained stationary, and one patient could count fingers at 2 or 3 meters distance. Since the operation eleven weeks have elapsed, and this result remains unimpaired.

Mr. von Hippel believes that although these shells may remain adherent for a time, they will finally fall off. He has made similar experiences with other materials.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, NOVEMBER 14, 1889.

J. HUGHLINGS JACKSON, M.D., F.R.S., President, in the chair.

Recovery from Hemianopsia, with Subsequent Necropsy.—Mr. Doyne read notes of a case occuring in an old man. The onset of hemianopsia (right-sided and homonymous) was sudden; fields of vision recovered in the course of a fortnight, but subsequently a quadrant of the oposite side of each field was lost. Death occurred from cerebral apoplexy. At the necropsy, in addition to the extensive extravasation which caused death, there were found symmetrical lesions (softening) on both sides of the brain in the cortex of the occipital lobe, one evidently more recent than the other.

Homonymous Hemianopsia; Recovery; Subsequent Death and Necropsy.—Dr. James Anderson gave an account of the case of a warehouseman, æt. 41 years, sent to him by Mr. Warren Tay on March 28, 1889, complaining of failure of vision for 6 weeks with severe frontal headache, and during the previous week much failure of memory and mental depression. He had been losing flesh for 4 months, had had no fit, no vomiting, and no loss of sensation or of motor power so far as he knew, but during the previous week he had had two severe falls from inability to see to his right side, and his speech and general manner had altered in character. The family and personal history threw no light on his trouble. He had eight healthy children, and denied all history of venereal disease. He was much depressed about himself, thin and anxious, and had some difficulty occasionally in finding words, but there was no loss of

gross motor power or general or special sensation except as regards vision. His gait and reflexes were normal, and the heart, lungs and kideys apparently healthy. The ocular and pupillary movements were normal, and with the exception of an old nebula on the left cornea there was no pathological change in either eye, the discs and fundi being quite healthy. He could read J. 1 with each eye separately, but only with difficulty. The right halves of both visual fields were lost up to but not including the line through the fixation point; the left halves were of average extent. From the symptoms, Dr. Anderson concluded that the patient had an intracranial growth, probably malignant, and situated in the medulla of the left occipital lobe, also that a hæmorrhage had taken place into the tumor at the begining of the previous week. He was admitted on March 29, into the London Hospital, and prescribed full doses of sod. iod. and liq. hydrarg. perchlorid. Perimeter charts taken on March 31, by Dr. Charles Wilson showed right homonymous hemianopsia with some contraction of the remaining left half of the right visual field. Within a fortnight the headache and mental symptoms had much subsided, and the perimeter chart of April 18 showed only slight contraction of the right halves of the visual fields. Mr. Grimshaw, the clinical clerk, who watched the fields from day to day, believed that the right halves varied considerably, being smaller on days when there was severe headache. The patient left the hospital on May 18, was seized with severe headache and vomiting on May 22, and on May 29, had a transient attack of left hemiplegia, which had quite passed off when he was readmitted into the hospital on June 20. The lower quadrants of the right halves of both visual fields were at this date deficient nearly up to the vertical line through the fixation point, especially on the left side, but otherwise the fields were of good extent, and reading vision was still J. 2 with the right and J. 3 with the left eye, and the fundi were normal. From this time he rapidly deteriorated in mind, and became extremely troublesome; his vision seemed to be more defective, but he would not allow his eyes to be examined. On August 9,

he was sent to Banstead Asylum, where he continued in a demented state and died on October 1.

The necropsy made by Dr. Clay Shaw showed a recent blood clot in the posterior cornu of the left lateral ventricle of the brain, with hæmorrhage and softening in the tissue external to this, involving the whole of the angular gyrus up to its surface, the central part of the area being occupied by a walnut-sized cavity containing a straw-colored fluid. The tissue replacing the angular gyrus was found to be gliomatous in structure. The rest of the brain and the remaining organs of the body seemed to be healthy, and there was no evident explanation of the temporary left hemiplegia observed four months before death. The improvement of the patient under antisyphilitic treatment and the subsequent transient left hemiplegia caused some doubt as to the early diagnosis, which was, however, confirmed by the necropsy. Dr. Anderson stated that he had not previously met with a case of recovery from hemianopsia, that in cases of hemianæsthesia with hemianopsia, for example, from a vascular lesion in the area of the posterior cerebral artery, even when the former group of symptoms disappeared, the latter, very generally at least, persisted. Hæmorrhage had in this case pretty certainly taken place into the tumor at the date of the patient's coming under observation, and a second hæmorrhage into it had been the immediate cause of death. The case was interesting in relation to modern views of visual localization.

The President said that the subject of the two papers just read concerned the very important question of cerebral localization. He mentioned two cases which had been under his own care; in one hemianopsia was associated with hemianæsthesia, in the other there was much mental confusion, but neither hemiplegia nor hemianæsthesia; he also referred to the frequent association of hemianopsia and word blindness.

Dr. Hill Griffith inquired if Dr. Anderson's case had exhibited the hemiopic pupillary reaction.

Dr. S. J. Taylor spoke of a case of hemianopsia in which the fields of vision regained their normal limits. Death occurred shortly after, but no necropsy was obtained.

Dr. Stephen Mackenzie thought that the two cases now reported pointed rather to the hemianopsia being due to pressure exerted by hæmorrhage on the parts of the brain concerned in vision. The fluctuations in the fields of vision during recovery lent support to that view rather than to the supposition that the function was taken on by some other part of the brain. He considered that the symptoms were caused by vascular changes in propinquity to the visual centres and the fluctuations in the field by variations in blood-pressure.

Mr. Lang referred to two cases of recovery from hemianopsia, and supported Dr. Mackenzie's views.

In reply, Dr. Anderson said that in his case the pupil acted well to light thrown on to either half of the retina. In Mr. Doyne's case it was certain that the two areas of softening in the brain were of different dates; the older patch being in the site of the hæmorrhage which occurred at the time of onset of the hemianopsia; the more recent patch marking the lesion which caused the subsequent loss of a quadrant of the fields in their opposite halves.

On the Size of the Cornea in Relation to Age, Sex, Refraction, and Primary Glaucoma.—Mr. Priestly Smith gave an account of certain facts obtained by measurement of the cornea in a large number of human eyes. The inquiry had been undertaken to test the truth of a suggestion he had previously made to the Society, namely, that small corneas were specially connected with a liability to glaucoma in its primary form. The measurements were made by means of a simple keratometer devised for the purpose.[1] The horizontal diameter only was measured, and the nearest half-millimetre was noted. The eyes examined were chiefly those of private and hospital patients with refractive errors or slight ailments such as could not invalidate the result. A number of healthy eyes of old people in a workhouse and an almshouse were also examined. A number of persons affected with primary glaucoma were examined in like manner. The normal cornea: 250 males and

[1]See Ophthal. Review, November, 1886.

250 females were examined, giving a total of 1,000 eyes, representing all life periods from 5 to 90 years of age. Age, sex, and refraction were noted in every case. Analysis gave the following results: general average 11.6 millimetres, size variable in individual cases, but not often greater than 12 or less than 11 millimetres; number greater than 12, 34 per 1,000, namely, 12.5, 30 eyes; 13, 2 eyes; 13.5, 2 eyes; number less than 11, 17 per 1,000, namely, 10.5 in every instance. Stature and size of head were not systematically noted, but there were many larger corneas in smaller persons and smaller corneas in larger persons, and therefore no general proportional relation existed in this respect. Classification according to age gave the following results: average between 5 and ten years, 11.67; between 10 and 20, the same; between 20 and 40, nearly the same; after 40, rather smaller, but the difference not large enough to be very positively asserted. The cornea, then—or at least its visible part—attained its full diameter very early in life, many years before the rest of its body completed its growth. Comparison of other data relating to size and weight of different parts during intra- and extra-uterine life (quoted from Vierordt and Manz) showed that the development of the cornea was precocious in relation to that of the eye as a whole; that of the eye in relation to that of the brain; that of the brain to that of the whole body. In advanced life the height of the body and the weight of the brain diminished; the apparent slight diminution of the cornea at the same period might perhaps represent an actual shrinkage due to the same slackening of nutrition, but this was merely a suggestion. Classification according to sex showed a very slight but probably a real difference in each life period, the cornea of the male being on the average about one-tenth of a millimetre the larger. Classification according to refraction showed the unexpected fact that the size of the cornea bore no relation to the refraction, being no smaller in hypermetropia, no larger in myopia, than in emmetropia. This was further proved by comparison of 90 highly hypermetropic with 90 highly myopic eyes. The size of the cornea was determined early in life, and was not affected by the

greater or smaller extension of the posterior hemisphere which might occur later. The cornea was full grown at 5, or earlier; at any rate it did not add one-tenth of a millimetre to its diameter after that age. The lens, a near neighbor of the cornea, was full grown only at the other end of life, and, if the life were a long one, added at least 2 millimetres to its diameter after the cornea had ceased to enlarge. This involved a gradual change in the mutual relations of the two which might have important consequences. The cornea in primary glaucoma: Sixty-nine persons having primary glaucoma in one or both eyes were examined in like manner. Number of glaucomatous eyes, 99; healthy, 32; some of the patients had lost one eye; the statistics comprise the whole. Average, 11.27; maximum, 12; minimum; 10. Number of corneas measuring less than 11 millimetres (spoken of as "small corneas"), 34, that was, 26 per cent. Comparing the glaucoma group with the same life periods in the healthy group, the small corneas formed 26 per cent of the one, 4 per cent of the other. More important even than this, among the 1,000 eyes of healthy persons there was not one cornea so small as 10 millimetres, while there were 9 such in the much smaller glaucoma group. A definite relation between the small cornea and primary glaucoma was thus proved. The explanation lay, in the speaker's opinion, in an undue proximity between the lens and the surrounding structures. But this explanation raised certain questions which called for an answer. Was the smallness of the cornea a consequence of the glaucoma? The changes occurring at the angle of the anterior chamber might be supposed to opacify the corneal margin. This idea was disproved by the fact that in 7 of the glaucoma patients both corneas were small, while only one eye was glaucomatous; in one of these the other eye was attacked later. This showed that the smallness of the cornea preceded the glaucoma, and was not caused by it. Was the small cornea small from youth up, or did it become so in later life? There were grounds for holding the latter view; small corneas were much commoner in the second half of life; but they were not entirely wanting in early life,

and might at that early age be associated with glaucoma (witness Mr. Hartridge's case shown to the Society on March 11, 1886). When the cornea was small, was the globe small in proportion? As shown already, the refraction gave no answer to that question; it could only be determined by a sufficient number of measurements of cornea and globe. In a recent case of the speaker's what appeared to be a faultless iridectomy, on a glaucomatous eye with a 10 millimetres cornea, was followed by no relief of the glaucoma. On excision some months later the eye proved to be exceptionally small, like the cornea, namely, 21 millimetres antero-posteriorly by 21 vertically by 22 horizontally. The refraction of this eye had been 5. D of hypermetropia. Lastly, was the small cornea associated with a proportionately small lens? If so, the speaker's explanation of the matter fell to the ground. In the case described the failure of the operation had arisen through obstruction of the wound, which could not have been made more peripherally, by the margin of the lens. Other specimens in the speaker's possession showed the same result. In the important case published by Hocquard and Masselon—microphthalmos with glaucoma—the eye resembled the one above described, but in an exaggerated form, and the lens was found to be "much too large for the eye." The structural conditions in question—large lens, small cornea—were not necessarily present in primary glaucoma, for the disease could occur in the absence of both; but they were conditions which either singly or together gave to certain eyes a greater than ordinary predisposition to it.

Treatment of Symblepharon.—Professor Snellen (Utrecht) described an operation for the cure of symblepharon, which had given him very satisfactory results. His plan was to free the adherent lid, leaving any conjunctiva which might be present attached to the globe. A flap of skin was then dissected from the cheek, having a narrow pedicle close to the border of the lid near the outer canthus; a buttonhole being made beneath this flap from the inner surface of the eyelid, the flap was drawn through and attached to the raw surface of

the lid. The conditions were peculiarly favorable for plastic operations, and Professor Snellen had been much pleased with the vitality shown by the flap. This plan had also proved of value in enlarging a socket for the reception of an artificial eye.

A New Operation for Ptosis.—Professor Snellen had recently adopted the following operation for cases of ptosis: A ligature was passed from without inwards through the entire thickness of the lid at the upper edge of the tarsus; the needle was then passed outward through all the structures but the skin at a point near the upper limit of the conjunctival sac, and made to perforate the skin near the original puncture. The ends of the ligature were then tied tightly on the surface of the lid. Three such ligatures were employed, disposed rather towards the nasal side, on account of the position of the levator.

On the Treatment of Episcleritis.—Professor Snellen recommended the injection, once or twice a week, of a 1 to 5,000 solution of corrosive sublimate beneath the swollen and thickened conjunctiva and episcleral tissue. By this means he had obtained good results in a few cases of very intractable episcleritis.—*British Medical Journal.*

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REGULAR ASTIGMATISM FOLLOWING CATARACT EXTRACTION.

BY SWAN M. BURNETT, M.D., WASHINGTON, D. C.,

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It is a fact well known to ophthalmic surgeons, though for the most part in a general way only, that a certain amount of regular astigmatism is the result of the operation of cataract extraction.

If one is to judge, however, from what one sees in the tex - books and from conversation with operators, it is not considered of sufficient importance to be taken account of in the fitting of glasses, except in occasional cases. The fair inference is that it is not the custom to search for its presence in a routine manner. The vision of a majority of those operated on for cataract does not, perhaps, exceed $^5/_{\text{XVIII}}$, but as this is usually sufficient for the needs of ordinary life, there is a feeling of satisfaction and content on the part of both surgeon and patient, and no effort is made to secure any thing better than can be had with spherical lenses alone.

In a paper read before the American Ophthalmological Society in 1888,[1] on the refraction of the healthy cornea, I stated that I would, in the future, report on the changes in the refraction produced by disease and especially by operations. This report I am not yet ready to make in full, but the recent appearance of a valuable and carefully prepared paper by Prof. Erasmo Scimeni[2], of Cagliari, on the corneal astigmatism following cataract extraction, has suggested the propriety of calling the attention of operators to the subject now, with a view of inducing a more careful and, indeed, a routine testing for astigmatism in all cataract cases.

As Prof. Scimeni's statistics are more extensive than any I could at present offer, being the result of the examination of the eyes of 146 persons operated on for cataract, and particularly as his results are so nearly in accord with my own, I deem a record of my individual cases unnecessary.

My ophthalmometric measurements agree with those of all other investigators, in showing that the astigmatism of the healthy cornea has its greatest refraction in the vertical meridian (axis horizontal). My examination of the corneæ of eyes which have been operated on for cataract on the other hand agree with those made by Scimeni, in showing the meridian of greatest refraction to be the horizontal (axis vertical) or approaching it. As the incision in cataract extraction lies either upward or downward, the inference is that the manner in which the wound heals has something to do in bringing about this change.

Weiss[3] supposed this to be due to a failure in exact coaptation of the wound, the lip of the flap coming forward in advance of the scleral edge of the incision. This would

[1]An analysis of the refraction of 576 healthy human corneæ examined with the ophthalmometer of Javal and Schiotz. Transactions American Ophthalmological Society, 1888.

[2]Sull' Astigmatismo corneale in seguito ad estrazione di caterratta; osservazioni oftalmometrische su 146 operati. Annali di Ottalmologia, Anno XVIII, fasc. 4, 5, 1889.

[3]Weiss. Corneal Astigmatismus nach Staarextractionen. Archiv. f. Augenheilkde B. vi, page 58.

of course increase the radius of curvature and diminish the refraction in the vertical meridian. Scimeni, however, has shown by calculation, that in the larger number of cases the great amount of astigmatism found could not be prduced in this manner, since it would necessitate such an advance of the flap lip as to remove its inner edge beyond the outer edge of the scleral lip of the wound. Such a condition would, and undoubtedly does, in many instances, cause some of the astigmatism by increasing the radius of curvature in the vertical meridian but does not produce it all, for Scimeni has found and my own observations confirm his in the main, that there is nearly always associated with the diminution of refraction in the vertical meridian, an increase in the refraction in the horizontal.

Scimeni attempts to account for the phenomena by a contraction of the recti muscles causing a gapping of the wound and a separation of its edges, and not simply by a sliding of the anterior lip forward over the posterior as advocated by Weiss. Such a gapping of the wound would undoubtedly produce both a lessening of the curvature in the meridian in which the incision lies, and, by traction, a corresponding increase in the direction at right angles to this. But whether this gapping is caused by contraction of the recti muscles, or by pressure of the lids, or by some fault in the incision itself or by all three, is still to my mind, an open question.

The clinical fact, however, still remains that the astigmatism is caused by a failure of the wound to heal properly. There is not union by first intention throughout its entire extent, but the healing occurs by the interposition of lymph, which undergoes a cicatricial contraction, and *pari-passu* with this contraction we find a diminution of the astigmatism, which comes about generally by a concomitant increase in refraction in the vertical and diminution of refraction in the horizontal meridian; leaving almost always, however, the vertical meridian still less refracting. We can say, therefore, that:

The Astigmatism Following Cataract Extraction is Contrary to the Rule.

The amount of astigmatism that remains as a per-

manency rarely exceeds 3D, but that is quite enough to seriously reduce the visual acuteness. I have stated in my "Treatise on Astigmatism," that an astigmatism of 1D or less can usually be neglected in cataract cases, and I still adhere to that opinion, but where it exceeds 1D, I believe it should, in every case, be corrected. The practical point I wish to make is, that the visual acuteness in cataract cases cannot be considered as definitely fixed within 3 months after the operation, the cicatrziation in some cases not being completed before the end of that time. This fact accounts in many instances for the unsatisfactoriness of the glasses first ordered and the necessity for a change some weeks later. A testing which is final 2 or 3 weeks after an operation, however skillfully done, if made without a search for astigmatism, is likely to do the operator injustice, and to deprive the patient of an amount of visual acuteness to which he is justly entitled. The following case will illustrate these points:

Rev. A. C., æt. 64, having a M=5D, was operated on for cataract by extraction, on March 14, a preliminary iridectomy having been made 4 weeks previously. Healing normal, with the exception of a very slight iritis. On April 8, an examination with the ophthalmometer of Javal, gave the following measurements:

Meridian with axis at 165° 38.5D; 75°, 48D. The normal refraction of the cornea is about 43D, so that it was 5.D greater in one and 4.5 less than the normal in the other meridian, the meridian approaching the vertical being the weaker in refraction. No spherical glass brought V up to $^5/_{\text{LX}}$, but with $+3 \bigcirc +9.$ 165° V=$^5/_{\text{XII}}$. These conditions remained about the same for several weeks and as he wished to use his eyes at once, I gave him $+3 \bigcirc +6.$ 65° (6.D being the strongest cylinder that is manufactured for the trade), which enabled him to see quite nicely (V=$^5/_{\text{XXIV}}$+), and with the proper spherical added, allowed him to read his sermons in the pulpit. These he continued to use with satisfaction up to the time he left for his vacation on the first of June. I left on my own vacation in July and on my return in October he reported with much dissatisfac-

tion with his glasses, which, he said, had been gradually failing him for the last month. An ophthalmometric examination showed:

Horizontal meridian 45.25.D, vertical 42.D., being an astigmatism of only 3.25.D. The horizontal meridian had, in that time, lost 3.25D., of refraction and the vertical had gained 4D. With $+7. \bigcirc +3$, 180° V=$^6/_{\text{XII}}$, and he claims to see better than he ever saw before. The other cornea shows a normal refraction with less than 0.5D astigmatism according to the rule.

Where there is, from any cause, an interference with the normal healing of the wound there is always a high degree of astigmatism. In one case recently where I made an extraction without an iridectomy there was a prolapse of the iris which I was compelled to excise on the fifth day. There was 2 weeks after the operation, an astigmatism of 18D. The meridian with its axis at 160° having 36D., the one at 75° having 54D. The final examination for glasses has not yet been made. In another case an astigmatism of 2.5D, 135°, completely disappeared as a result of the operation, the cornea having 43.5D. in all its meridians.

It has not yet been determined that one method of extraction has any advantage over another in lessening the tendency to change in the form of the cornea, for those cases where extraction is made without iridectomy are as frequently attended with astigmatism as when it is made with iridectomy.

ACUTE GLAUCOMA OF THE RIGHT EYE IN AN INDIVIDUAL ÆT. 28 YEARS, IN WHICH THE LEFT EYE HAD BEEN DESTROYED BY TRAUMATISM THREE YEARS PREVIOUSLY. ATTEMPTED IRIDECTOMY FOLLOWED BY COMPLETE DISPLACEMENT OF THE LENS INTO THE VITREOUS.

BY B. E. FRYER, M.D., KANSAS CITY, MO.

F. B., a very dense German farmer, was brought to me from Nebraska, by a very intelligent minister, December 5, 1889. The man, though not robust, was in a fairly good state of health, æt. 28 years. He was free from constitutional taint, no rheumatism, no syphilis. The left eye had been destroyed three years before by a fragment of iron cutting it. It was not known whether a foreign body had remained lodged within the eye. This eye shows staphylomatous enlargement in the upper and outer portion of the ciliary region. The lens is dislocated into the anterior chamber. Tension +1. Vision of this eye is only a very trifling light perception. It is sensitive to pressure, but not markedly so. There is no external congestion.

The right eye became painful five weeks ago. He has had more or less continuous headache; also vomiting several times. This eye is congested externally; the pupil is irregularly dilated. The anterior chamber is shallower than normal. The lens is partially opaque; the fundus not discernable. T.+3. V.= counts fingers at four feet. The eye is still painful, and there is browache, but he has not vomited for a few days.

The gravity of the situation was fully explained to the pa-

tient, who did not seem to be able to appreciate the condition at all, nor could he be made to realize it, though his friend who brought him informed me that a younger brother of this man had become blind from sympathetic ophthalmia following a trauma.

Believing that the destroyed eye might probably be a factor in causing the glaucomatous condition of the other eye, I proposed enucleation of the left eye, and an iridectomy of the right. At first all operative interference was rejected, but finally next day his consent for an iridectomy was given.

The operation (iridectomy) was commenced after a thorough cocainization. The incision was made by a curved lance-shaped keratome extremely keen in point and edge, the knife was passed in through the corneo-scleral junction at the upper portion and the point was directed away from lens and close to cornea after its entrance into the anterior chamber. An incision of about 7 millimetres was made. The withdrawal of the keratome was slow, and but little aqueous followed it. The patient, however, at this step of the operation made considerable pressure with his lids. The fixation forceps was removed at once and while I was about to enter the iris forceps to seize the iris, a small bead of quite fluid vitreous escaped. The speculum was now removed. Since I believed it safer not to make any further effort to withdraw a portion of the iris the eye was bandaged.

The day following the eye was free from pain; tension was normal. The wound was closed; the pupil more contracted. But it was found on illuminating the eye, that the lens was completely detached from the zonule of Zinn, and was displaced downward and backward, and lying upon the floor of the vitreous chamber. Quick rotation of the head or eye demonstrated that the lens moved freely in its new location. With a +12 D. vision was somewhat better than before the operation of the previous day. The subconjunctival redness was less.

The patient returned home the following day, against my advice, so that a further history of the case cannot be given.

As to just how or even exactly when the lens was displaced,

it is impossible to say. It was *in situ* the day before the operation. There was no external pressure exerted upon the lens during the operation; there was no touching of the lens by any instrument. It would seem possible when the small quantity of the aqueous which escaped on removal of the keratome, that the balance of anterior and posterior pressure being upset, the pressure posteriorly ruptured the zonule, setting the lens free, and the patient being in a half reclining position in the operating chair, it sunk back into the vitreous, which latter was more fluid than normal. This is surmise, however.

The examination showed that the lens was completely displaced and no portion of zonule connected with it.

It is to be regretted that no further account of the case can be given. The man could hardly be persuaded to remain to have anything done for him from the first as no promise could be held out of restoring his vision by operation. It was with difficulty, so dense was he, that he was dissuaded from going home the day of the operation. When he left the eye was quiescent, no pain and no increase of tension.

I place the case on record hoping that if others may have met with anything similar, where an iridectomy for glaucoma has been followed by dislocation of the lens into the vitreous, it may also be recorded.

As to whether or not the destroyed (left) eye was a factor in the production of the glaucoma in the fellow-eye cannot, of course, be decided. This man was well below the average age for glaucomatous attacks and, as far as can be ascertained, is without hereditary predisposition to glaucoma. The general belief is that glaucoma is not produced symphathetically—but is sympathy never a factor?

ON CHRONIC AND RECURRENT HYPERÆMIA OF THE BULBAR CONJUNCTIVA DUE TO SYPHILIS.

BY ADOLF ALT, M.D.

In the extremely valuable book on "Syphilis and the Eye," by Dr. Alexander,[1] which, besides giving the author's very large experience, goes over this whole interesting field in all its details, several forms of *conjunctival* affections are mentioned as having been reported in literature.

Mauthner and Lang have described an obstinate catarrhal conjunctivitis, as due to syphilis and a sign of the generalisation of the specific virus. The originals of these communications I cannot find.

In *Hirschberg's Centblt. f. Augenheilkunde* April, 1888, Goldzieher reports two cases of what he considers as true syphilitic conjunctivitis and as a form of the disease hitherto not described. The characteristic symptom of this conjunctivitis is the formation of granules in a diffusely infiltrated conjunctiva with a colloid appearance. This affection yields to no other treatment than an anti-sypilitic one. He compares this affection to the specific swelling of the lymphatic glands in other parts of the body, and considers as a sign of universal syphilis. Macauley and Sattler each describe similar cases. Sattler, moreover, states that the histological examination proved these granules to consist of endothelial cells, and, therefore, to differ totally from trachoma granules.

Primary affections situated in the conjunctiva, that is chancres, secondary affections in the form of papules and eruptions

[1]Verlag von J. F. Bergmann, Wiesbaden, 1889. (The Editor takes this occasion to thank the Publisher for sending the work).

similar to those of the skin, as well as gummatous tumors have been described. Alexander could sum up 37 cases of these affections.

A number of years ago I saw for the first time a condition which I do not find mentioned in Alexander's work, and for a description of which I have looked in vain every since. Whether Mauthner's and Lang's cases of "obstinate catarrhal conjunctivitis" were similar to my cases, I do not know. I do not intend to claim priority, but to add my mite of knowledge to that of others, and thus the description of my cases may not come amiss.

1. Mrs. A. H., æt. 67 years, a midwife, called on me July 21, 1881. The reason was, as she stated, the second attack of a very annoying and unsightly affection of the eyes. The former attack, a year ago, had lasted about six months and then disappeared. The present attack was of six weeks' standing, before she called on me.

I found the following conditions: Both bulbar conjunctivæ were slightly œdematous and of a scarlet red. It seemed as if every blood vessel lying in the bulbar conjunctiva was dilated and filled to its utmost capacity with blood. The palpebral conjunctivæ were but slightly injected, and their condition was in no way to be compared to the enormous hyperæmia of the bulbar conjunctivæ. There was no discharge whatever. The pupil answered but sluggishly to the stimulus of light. Vision was perfectly normal, there was no error of refraction and no intra-ocular trouble, more especially no sign of any choroidal inflammation to be seen in either eye. Tension and field were normal.

The subjective symptoms the patient complained of, were a continued feeling of heat, dryness and grittiness, and these symptoms became aggravated as soon as the patient tried to make use of her eyes for any close work, when profuse lachrymation was added to their number.

The patient had gone through several modes of local treatment without the least change in her condition. I employed first cold bathing, then hot bathing, instillations of pilocarpine

and inspergations of calomel with little benefit. I then tried massage with the yellow oxide of mercury ointment. The patient considered herself decidedly better under this treatment, but being engaged in a case of confinement she had to discontinue her visits at my office. It was only then, when perscribing for her and giving her directions as to the further treatment, that I happened to suspicion syphilis as, perhaps, being the cause of the trouble. The patient at once told me that she had been infected 4 years previously, but thought herself cured of the disease. I then told her to discard all local treatment, and under continued treatment with mercurials the affection of the eyes slowly disappeared.

2. In 1886, on March 24, Dr. W. C., æt. 53 years, consulted me on account of an affection of the right bulbar conjunctiva of exactly the same nature as described in case 1. The doctor had had the misfortune to wound himself in delivering a syphilitic woman 3 years previously.

The disease had so far apparently run a mild course under the influence of early mercurial treatment. The patient had, however, stopped all mercurial treatment for about a year, when the eye trouble began. He had at the time gummata in the skin which seemed to have no tendency to ulcerate. The patient was especially worried by the inability to read even for a few minutes on account of the irritability of the eye. There was no intra-ocular disease, and no error of refraction. Aside from recommending a mercurial course, I tried massage in this case at first with iodol and then with yellow oxide of mercury. Both remedies, however, proved so irritating, that I had to give it up. The eye-affection in this case, also, yielded slowly, but completely to mercurial treatment.

3. L. L. S., æt. 62 years, consulted me on February 8, 1889, on account of an eye-affection concerning the right bulbar conjunctiva principally, but also to some degree the left one. I at once put the question to him: When did you have a chancre? and received the answer: A year ago. The symptoms in this case did not differ from those related above. No other affection of the eye could be found, the fundus being absolutely normal. No error of refraction.

Under mercurial treatment, at once instituted, the hyperæmia of the bulbar conjunctiva at once disappeared almost perfectly, that is, a few enlarged vessels remained dilated. The disagreeable subjective symptoms, however, vanished altogether, so that the patient attended to his business again. No local application was made use of.

Three weeks ago this patient returned with the same trouble in the same eye. From the history he gave, he had evidently gone through an attack of brain-syphilis, and he was still so weak that he could barely get about. He is now under treatment with iodide of sodium and is improving.

4. On August 17, 1889, T. M., æt. 55 years, presented himself at the clinic of the Beaumont Hospital Medical College, with both bulbar conjunctivæ slightly œdematous and highly congested. He stated that he had had similar attacks off and on for years. The first one came on two years after infection with syphilis. He had been treated locally without effect. Mercurial treatment was prescribed, but the patient never returned.

In the four preceding cases the symptoms were all alike, and an infection with syphilis was acknowledged. The three cases which remained under my personal observation, healed under mercurial treatment while local treatment was of no avail whatever in any of the four. There was no complication with this hyperæmia of the bulbar conjunctiva on the part of any other membrane of the eyes attacked. This form of hyperæmia of the bulbar conjunctiva must, therefore, be considered as a disease *per se*, not a symptom of another intra-ocular eye-effection. It evidently is a peculiar localization of the syphilitic virus. The attention being drawn to this fact, I suppose others will be able to report similar experiences.

The following case I wish to relate, although I do not believe, that it belongs to the same class:

On November, 8, 1889, P. M. W., æt. 48 years, consulted me on account of an intense hyperæmia of the left eye. I thought at once the case belonged to the same class as those just related. The patient, a strong and healthy man, however, abso-

lutely denied a specific infection, nor was there any sign of syphilis to be found. The patient stated that such attacks had occurred at intervals of months for 15 years, and that none of the many modes of treatment he had undergone had helped him in any way. He had been subject to rheumatism for about the same period. The present attack was 4 days old. In this case the attacks came on with intense pain, which subsided the second day. Then followed a continued feeling of grittiness and heat, and this and the inability to use the eyes were the symptoms which remained for weeks, and then gradually disappeared. The function of the eyes was otherwise normal. While, however, in the preceding cases the fundus was totally normal, in this case the optic disc was red and the retinal veins were dark, enlarged and tortuous.

I prescribed hot bathing, massage and, internally, salicylate of sodium. I saw the patient again about a month after. His condition had rapidly improved after his first visit, but he had now a new attack in the right eye. I recommended the same treatment, but increased the dose of the salicylate of sodium. The patient has not since returned.

To avoid being misunderstood, I will state that the hyperæmia, as described above, is in no way to be confounded with the œdematous and hyperæmic condition so often seen in drinkers, nor, of course, with a catarrhal affection, there being no discharge. The palpebral conjunctiva was normal, or barely injected in all of these cases.

TRANSLATION.

ON COLORING THE DISEASED CORNEA BY FLUORESCEINE AND THE USEFULNESS OF THIS COLORATION IN MAKING DIFFERENTIAL DIAGNOSES.

BY DR. THOMALLA, FRIEDLAND.

(*Hirschberg's Centralblatt.*)

Dr. Straub, Military Surgeon in the Netherlandish army, having proven, that it was possible to color portions of the living cornea which are devoid of epithelium a pronounced green by means of fluorescine, I made experiments with a view to finding the exact value of this coloring substance in helping to diagnose a number of further corneal affections. In these experiments I made use of:

1. Merck's fluorescine, looking yellow in substance.
2. Gruebler's fluorescine, looking red in substance.
3. Gruebler's fluorescëine, looking light red in substance.

The fluorescëine I considered the most useful. I applied it in a two per cent solution; this had to be made in a three and a half per cent solution of carbonate of sodium. Since the many hundreds of patients on whom the experiments were made never complained of pain, this high percentage of alkali was not in my way.

With regard to the coloring qualities of my solution, I want to state at first, that a perfectly normal and uninjured cornea does not get colored by it, as proven by trial in 40 to 50 cases. I further saw in about 50 experiments, that it is impossible to

stain old and perfectly cicatrized wounds, or maculæ corneæ.

My solution colors the cornea wherever there are defects in its epithelial coat. In one case of a burn with lime, the burnt place was also colored green, but, while the corneal tissue proper was stained a deep green, it was covered by a loose epithelial cover which did not accept the stain.

I made the same experiment on the eyes of pigs (after removal) and of living rabbits with exactly the same results. Defects in the epithelial coat artificially produced, and parts burnt with the galvanocauter were colored green, until the epithelium was reformed.

Ulcers of the cornea showed the same pronounced coloration as did the artifical defects, until they were perfectly healed and all irritation was gone. Once only, to my astonishment, the strange thing occurred, that the site of an ulcer which was apparently perfectly covered by epithelium, got colored peripherically after a prolonged action of the solution. Since in the healing of an ulcer the epithelium grows from its periphery, this case can be explained only on the supposition, that the ulcer had healed in an anomalous way, and that certain parts were still diseased when others were already covered by epithelium.

The corneal tissue is furthermore colored when it contains *a foreign body.* After a drop of the fluorescëine solution has been dropped into such an eye, an area of green is always found around the foreign body. When the latter has been removed an evenly green color is seen, where it lay. If, however, but a small particle of the foreign body remains behind, a dark point shows plainly within the green. After its removal only does this portion, too, get green. When a foreign body has been completely removed, and yet the symptoms of irritation do not decrease after a few days, and if then its site can be colored green, we can with certainty diagnose an ulcerating keratitis.

Perforating wounds of the cornea show a coloration which begins at the wound-lips and spreads toward the uninjured parts of the cornea. This coloration can be produced until the cica-

trization is absolutely accomplished and every particle of inflammation is gone. Scars in the cornea never accept the color.

In all forms of *inflammatory processes* in the cornea, as in keratitis exulcerans, fascicularis, and interstitialis diffusa, the diseased portion shows a pronounced green color at once after the solution has been instilled. This is the case especially in all those inflammatory processes which are combined with an infiltration. In the same way the green coloration is easily produced where there is pannus, whether it is caused by trachoma or by scrophulous keratitis.

In cases of *iritis serosa* that portion of the iris the posterior surface of which is "dusty," shows a distinct green color, when there is an abnormal condition of the epithelium accompanying it. In some cases of chronic iritis, too, a slight coloration was visible.

Unfortunately I have never had an occasion to try the solution in a pure case of *specific iritis*, since this affection was always combined with some form of keratitis or pannus. In these cases coloration always took place. Yet I could not determine whether it was owing to the keratitis or the iritis.

When experimenting on eyes with *glaucoma*, I found that in acute glaucoma a part of the cornea became colored always, and generally the color from there entered the remainder of the cornea. During these experiments one patient complained of complete symptoms of glaucoma in the left and the appearance of colored rings in the right eye. The examination with the ophthalmoscope revealed positive proofs of acute glaucoma in the left eye, while in the right eye nothing could be seen. The fluorescëine coloration of the left cornea was very pronounced, while that of the right eye was but slight. Ten hours later—the left eye had meanwhile been operated on—the right eye had a severe attack of acute glaucoma.

In several cases of *chronic glaucoma* no coloration could be obtained. In a few where a coloration appeared, it was much lighter than in acute glaucoma.

Of the *affections of the conjunctiva* the *phlyctaenulæ* take up

the color, but it needs a much more prolonged influence of the fluorescëine solution than in the corneal affections. Instead of the green color, we saw in the cornea, the color produced in the conjunctival phlyctænulæ was yellowish-brown. The results of my numerous experiments in follicular conjunctivitis, trachoma, and spring-catarrh were invariably negative. In spite of the prolonged influence of simply concentrated solutions not the least coloration could be obtained.

The cornea never took up color in cases of *hypopyon.*

The spreading of the color over the healthy cornea is undoubtedly brought about by the lymph-chanels of this membrane, as has been proven by actual observation and by means of the microscope. The question is, however, in what manner this takes place. I injected my solution into the anterior chamber of rabbits by means of a Pravaz–syringe, and saw that the color spread into the cornea from the canal made by the needle. As in other experiments, it was only the connective tissue of the eye which took up the color, while the epithelium and endothelium remained uncolored. As I stated above, in cases of burn with lime the color entered under the detached layer of epithelium and thus reached the connective tissue. In the same way the coloration takes place, when the epithelium is excoriated. The same explanation may hold good in corneal ulcers. In these cases, too, the epithelium is partially diseased, partially detached, and thus the corneal connective tissue is colored until the ulcer is again covered by newly formed epithelium. During inflammatory processes in the cornea the epithelium is diseased over the site of the inflammation, and in consequence the cementing substance lets the coloring material pass through easily; thus the connective tissue is stained, while, as in the case of a burn with lime, the epithelium remains uncolored. The coloration where there is a foreign body can be explained in the same way. The cornea is injured where a foreign body enters. Thus the epithelium is removed from a small area around the foreign substance, sufficiently so as to allow the coloring substance space enough to enter. But even if this small defect in the epithelial coat,

by which the coloring fluid may enter, should be wanting, the coloration may be explained by the fact, that an inflammation is set up in the cornea by the presence of the foreign body, and that the cornea is colored as it happens in keratitis. The coloration in iritis serosa is certainly also to be explained by the fact that alterations in the cornea, which are probably of an inflammatory character, give rise to a diseased condition of the epithelium which then allows the coloring substance to enter.

The changes in the nutrition of the cornea are, I think, sufficient to explain why the staining takes place in acute glaucoma.

According to the views of Heidenhain, Snellen and Meynert concerning the paralysis of the intracranial trigeminus nerve (by cutting) we may assume, that in cases of glaucoma the high intraocular pressure produces a partial paralysis of the peripheral nerve filaments in the cornea. This is undoubtedly true with regard to the sensitive nerves, as is proven by the diminished sensibility of the cornea in glaucoma. The function of the trophic nerves might be interfered with in the same manner. Whether or not the eye be exposed to external injuries, this would cause an alteration in the nutrition of the cornea, causing in turn a diseased condition of the epithelium, and thus the taking up of the color might be explained.

My method of coloring the corneal tissue may be useful in making the following differential diagnoses.

1. In order to find out, whether a corneal affection is old or recent, since a recent keratitis always became colored, while an old macula never took up the stain. In this way the color will show when a recent affection is healed, since the faculty of becoming colored will then disappear.

2. In order to make the differential diagnosis between hypopyon and infiltration of the cornea (! Transl.).

3. In order to distinguish between pinguecula with conjunctivitis and phlyctænulæ, the diagnosis being sometimes difficult in these cases. Phlyctænulæ take up the color, pinguecula does not.

In order to make a diagnosis the fluorescëine solution may be valuable :

1. In cases of excoriation of the cornea; in these cases it will show exactly when the excoriated part is again covered totally by epithelium.

2. In order to make sure whether an ulcer is perfectly healed or not.

3. In order to see when perforating wounds of the cornea are perfectly healed. It will be necessary for the patient to wear a bandage until the wounded parts can no longer be colored.

4. The application of the solution will be of great importance in all cases of foreign bodies in the cornea. It is often impossible to recognize a dark foreign body in the cornea, when the iris is dark also, even by means of oblique illumination. One drop of the fluorescëine solution at once produces a green area around the foreign body so that it is easily recognized and therefore easily removed. When the foreign body is apparently removed, the fluorescëine solution gives the exact proof whether or not a small particle has remained behind. If any has remained behind, a small dark spot can always be seen in the area of green.

5. It is as yet impossible to state in how far the solution will be of value in making a diagnosis in cases of acute glaucoma. It is my opinion, however, that in cases of acute glaucoma the cornea shows a coloration as soon as the tension is increased enough so as to alter the epithelium and to give the surface a greasy appearance, and before a sure diagnosis can be made with the ophthalmoscope.

6. The staining with my solution will find a large field of usefulness in eye-diseases of children. It is well known how difficult it has so far been to recognize slight affections of the cornea. One drop of my fluorescëine solution will make the diagnosis easy, since a recent affection of the cornea, its character, and size will at once become visible.

SELECTION.

NOTE ON TESTS FOR COLOR BLINDNESS.[1]

BY KARL GROSSMANN, M.D., F.R.C.S.E.,

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At the last meeting of this Association at Glasgow I demonstrated some models of tests for color blindness. Through various circumstances it has not been possible to have them turned out in large quantities up to the present. Meanwhile, some criticism has been brought againt my tests. I should, perhaps, not have answered, considering the criticism appeared in the lay press; but it was asserted to be backed up by a medical authority competent in the matter, but whose identity I am ignorant of. This slight controversy appears to me to be due to nothing else but a mere oversight.

Owing to the great difficulties which I met in the way of the practical multiplications of my models, and which were purely accidental from one cause or another, there was only a few sets made altogether. As I demonstrated at the Glasgow meeting, some of these twin-colored tests were to be used by lamplight, some by daylight. I showed how, by means of pale greenish-blue glasses, the lamplight set could be changed into a daylight set, while a certain pale yellow glass held in front of the daylight set made it answer for gas or lamplight. It seems that these two sets have become mixed up, and the misunderstanding arose through the lantern not being supplied with the blue and yellow glass discs.

[1]Read in the Section of Ophthalmology at the Anual Meeting of the British Medical Association held in Leeds.

As far as the principle of the test is concerned, I need not say anything here. It has been said in those criticisms to which I before alluded that Holmgren's test is the best because it is at once simple and infallible. It certainly is a simple test and a very good one, and I should not like to be without it; but infallible it certainly is not.

Not so very long ago a case came under my notice where a red-green blind person—well educated—acquitted himself perfectly well of the examinations(repeated ones)with Holmgren's wools, but failed to recognize some of my glass letters and other tests. I am sorry to have to keep the gentleman's name to myself, as he strongly objects to having his defect known; but to those who perhaps think my experience in this instance too exceptional I need only refer to similar experiences published by Professor Pflüger of Berne. He found in a post-graduate course on ophthalmology which he was then giving to sixteen army surgeons that there were two of them completely red-green blind, as proved by his own other tests; but when tried with Holmgren's wools, they made not the slightest mistake.

This may suffice to show that Holmgren's test is not sufficient for every case of color blindness. Especially in the case of the educated we have to be extremely careful, and men who prepare for the command of a ship belong this class.

I may just mention another point in connection with this, not of a very first-rate importance in itself, but not to be neglected when it comes to the examination of large numbers. In order to compare the quickness with which different tests could be applied I examined schools. For Holmgren's tests the average time for each schoolboy was about five minutes, so that not more than twelve could be tested in an hour. With the twin-colored tests I could easily go through the ten-fold number in the same time. Once the teacher, who soon very kindly helped me, hit upon a very expedient plan, when I wanted some color-blind boys quickly for some other purpose. He took a few of my glass discs, held the sample disc up, and said to a class where no investigations had been held before: "You see this letter; it is a B. Write it down on your paper. Now I hold up

another letter; write down what this is." Up went four boys who said they could not distinguish any letter at all; and those four were soon found to be red-green blind.

This shows that a considerable advantage may be derived from the promptness which my tests admit when perfect. The only drawback I have been able to detect up to the present is the difficulty in producing them, and the great amount of personal annoyance and fatigue they imposed upon me. For these reasons I have tried to modify them, Instead of the glass mosaic I tried to get pattern printed on gelatine, after the style of the imitation stained glasses. I have not been able to obtain any proper samples to be shown at this meeting to-day. It seems as though manufacturers do not care to put themselvas to great trouble for any scientific or other work which, to all expectations "does not pay." I then made an attempt to have a sample letter printed in some twin colors, without any trace of gloss on them, and for this purpose I thought a white woolen material would be the most suitable. For this I had to go across the Channel to one of the best known firms in Saxony and I have the pleasure in showing you herewith the first batch, which I only got quite recently. The colors are not quite perfect yet, but will be sufficient to show what can be done. I intend going to the manufacturer at an early date and we may be able to obtain something good. These prints could easily be multiplied to any extent, would be cheap, and could be mounted in any suitable form.

I may add that this mode would have the additional advantage of allowing an edition of prints adapted to non-typical color blindness, such as experienced in tobacco amblyopia, etc. At present I have not the time nor a sufficient number of cases to have settled the colors suitable for these defects.—*Brit. Med. Jour.*